20251201

Developed to meet the high demands of the
European Automotive Industry.

⚙️ **Scalable & Flexible** – Adapts from small projects to enterprise systems
🧩 **Open Architecture** – Extensible, customizable and future-proof
🔗 **Seamless Integration** – Works standalone, in larger systems or collaboratively in swarms
💰 **Cost-Efficient** – Modular design, reusable components, no yearly fees
🛠️ **Versatile Applications** – Supports development, testing, lab work and system engineering
📏 **Simple, Powerful Design** – Compact footprint with high-quality, straightforward components

HoPHiL

Test. Automation. Simplified.

Compact. Scalable. Powerful.

Example Use Cases:

Basic Functionality
Relay-Card, Current/Voltage Measurements, CANFD communication,
Ethernet/CANFD/RS232/DAC/ADC/PWM Gateways

Extended Functionality
Real-time HiL Test equipment for safety & security testing with fault injection
Advanced Break-Out-Box (HW Fault Injection)
Current measurement and real time sensor simulation for closed loop testing
Automatically generated CAN FD Rest Bus Simulation with E2E (Autosar Profiles)

Expert Functionality
Environmental Simulation of Sensors, Loads, ECUs
Cyber Security (SecOC Simulation, PEN/FUZZ/Attack Testing)
ESX Virtual Machine support for easy cloning HiL Hosts
Jenkins Continuous Integration and HiL Load Balancing
In-Vehicle Safety & Security Testing with Fault Injection on Secured Content
Visualization of CAR specific data (CAN FD, Sensor, XCP, UDS, LIN, ...) (Acquisition, Presentation)
Autonomous Learning/Testing
Autosar Time Synchronization Over CAN – ECU Synchronization & Time Acceptance Test + Fault Injection

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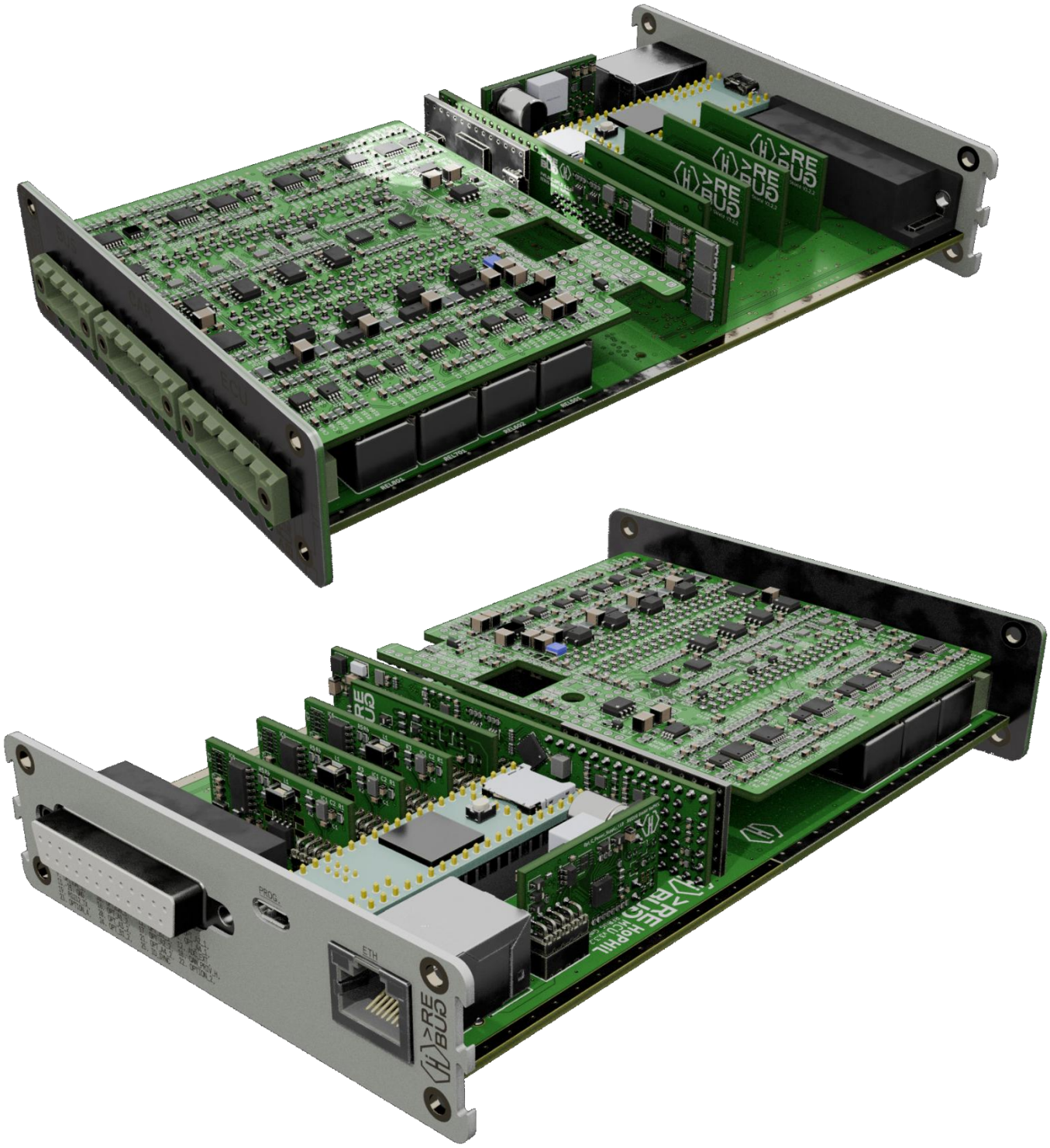
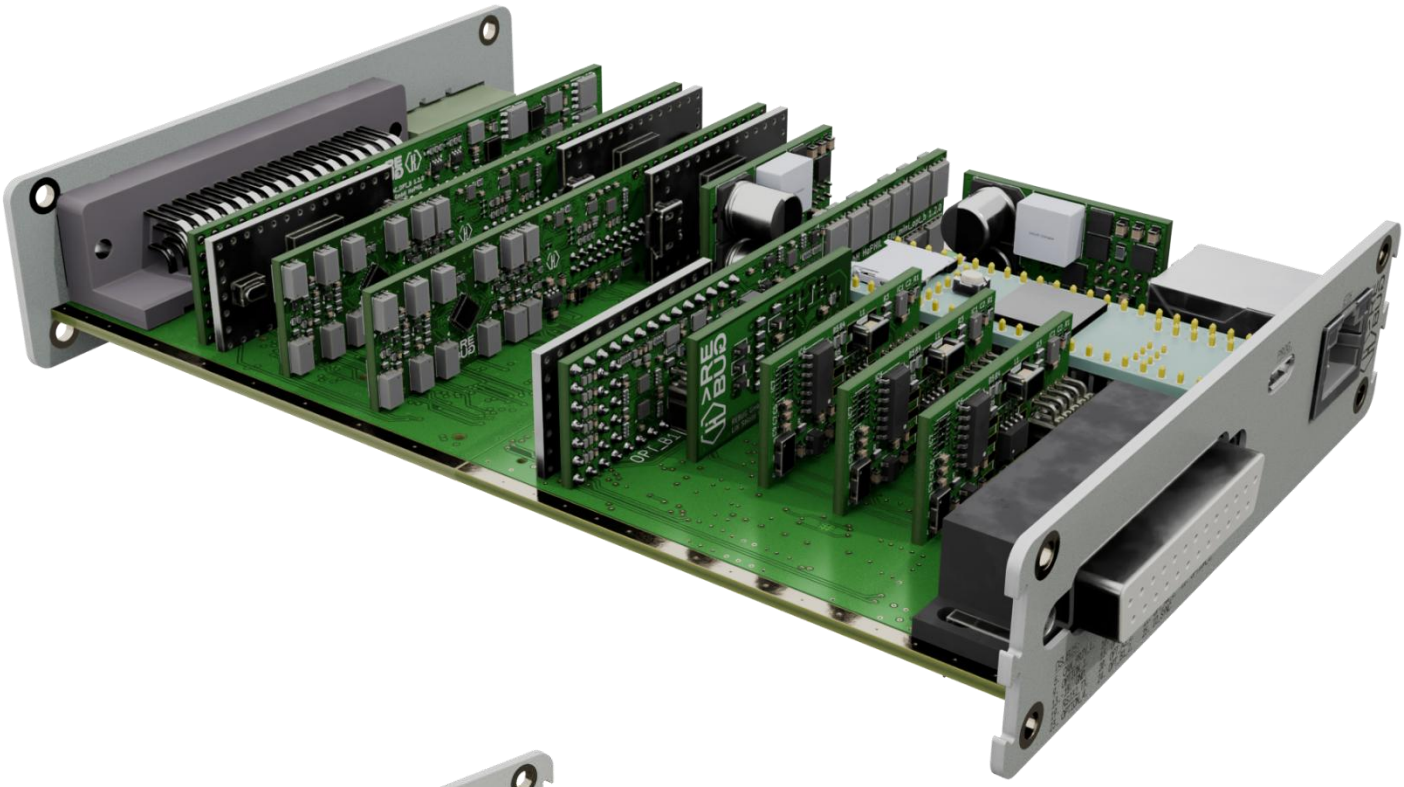
FN 323019d

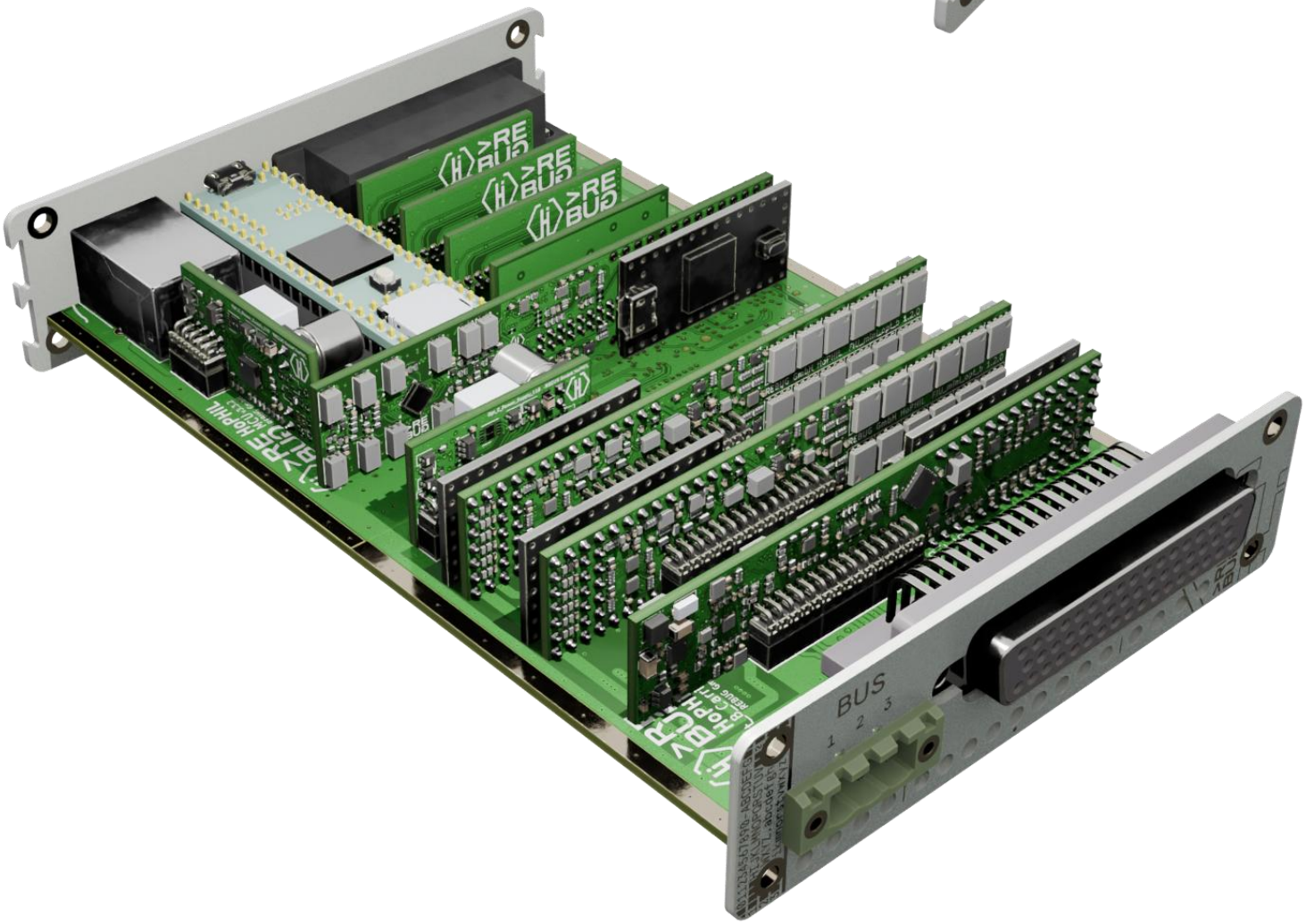
HoPHiL Realtime Node – GEN3 (Hardware)

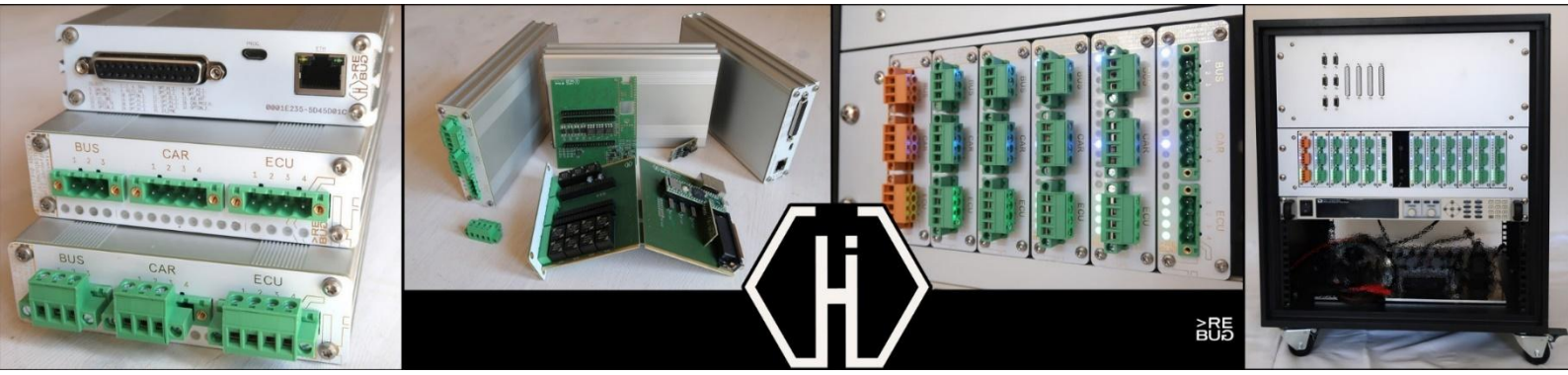
HoPHiL Fault Injection Unit for Environmental Simulation designed for Fault Injection



More Flexibility with HoPHiL Carrier and OPT_B Modules

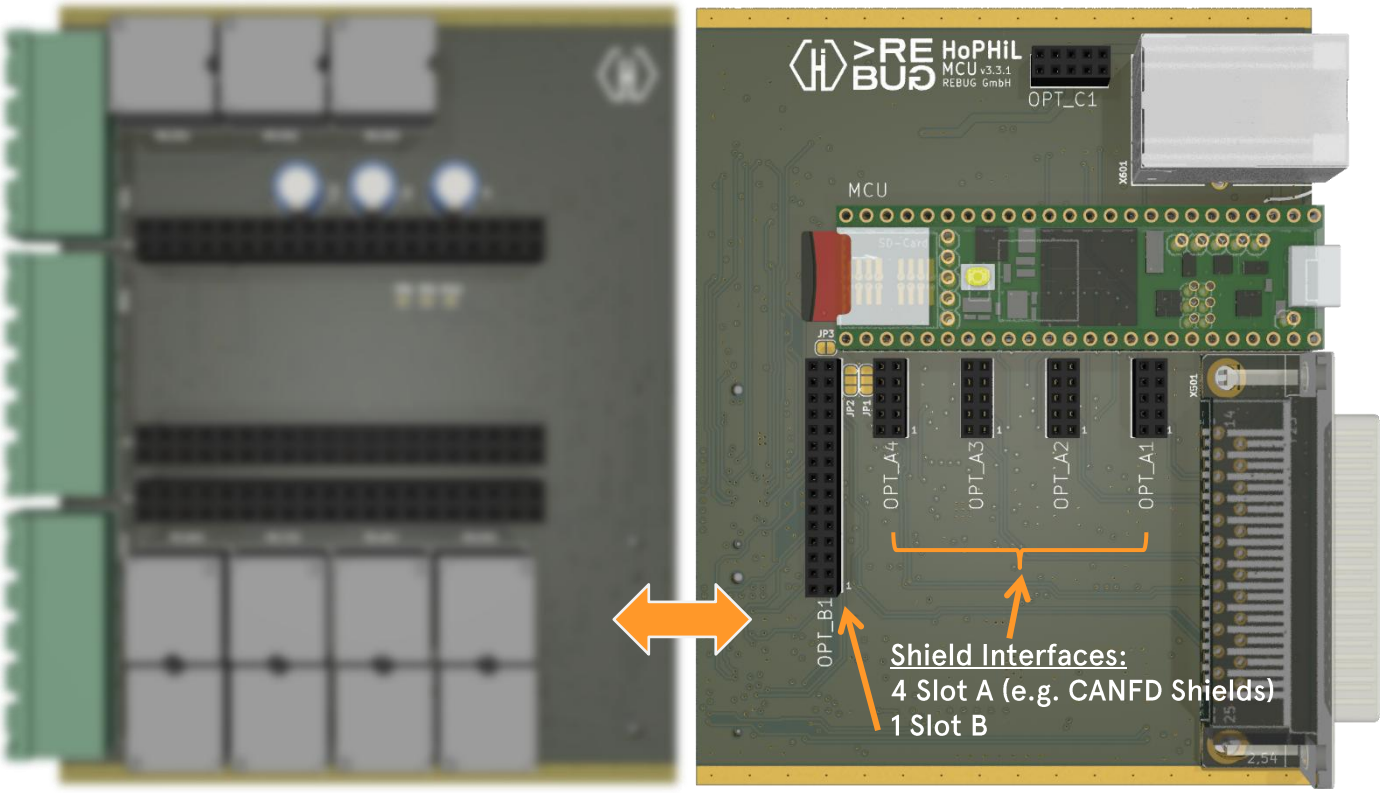




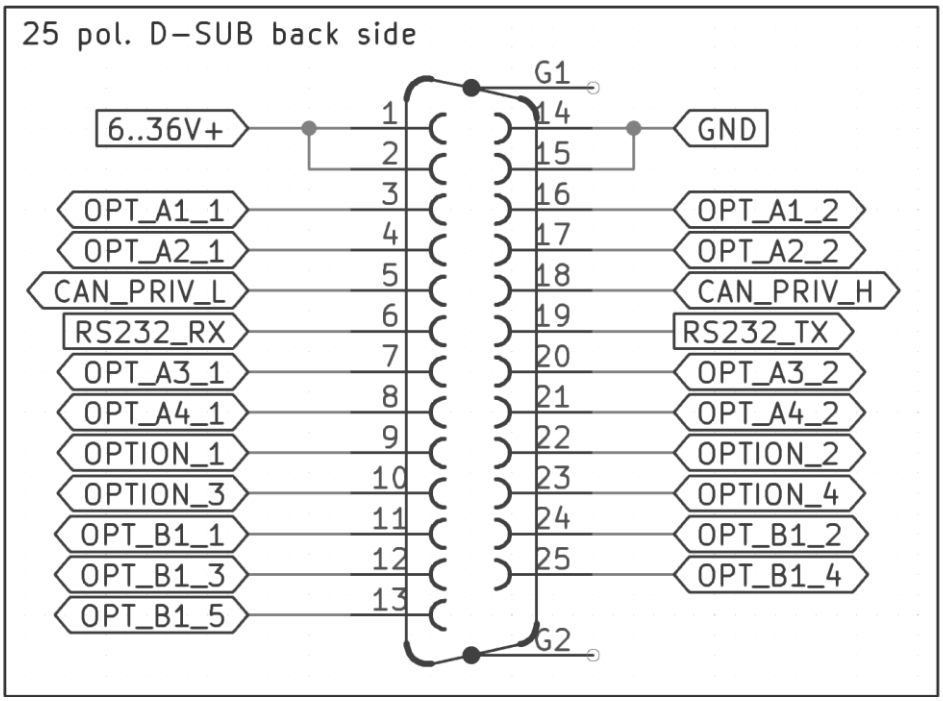


MCU

Element	Details	Notes
Micro Controller	ARM Cortex-M7, 600 MHz	Passive cooling Firmware runs at a control-loop of 1ms cycle time
Remote Control	Ethernet 10/100 MBit/s or CANFD (limited functionality)	Ethernet is the main interface to control the device; CANFD Privileged is a second option to control the device (e.g. for integration to existing HiLs).
Plugs (rear side)	1x RJ45 (10/100 MBit/s) 1x DSUB25 1x USB Micro	RJ45 for main HW control interface DSUB25 is used for power supply, CANFD, RS232,... USB Micro for firmware update
SD Card Slot	1x	
CANFD Privileged	1x	Used for remote control, internal communication of several HoPHiLs or typical communication like Rest Bus Simulation, UDS, XCP
Slot OPT_Ax	4x SPI expansion slots (10 Pins) 2 IO-pins each on DSUB25	Up to 4 shields can be inserted - e.g. additional CANFD Channels.
Slot OPT_B1	1x Serial, I2C, SPI, CAN_PRIV expansion slot (30 Pins) 8 IO-pins on DSUB25	e.g. customer shield FIU_mini_Opt_B Pwr_DAC_Opt_B
Slot OPT_C1	1x I2C, power-supply expansion slot (10 pins)	Variable power-supply module required for FIU-Option, FIU-Shield and Power-DAC
RS232	1x	e.g. external power supply control
Housing	160 x 30 x 110mm (aluminum) V-Groove Mounting Concept	Typically delivered in one housing together with OPTION board (e.g. FIU_Option). V-Groove mounting via countersunk head screws.
Power Supply	6-36V	Useable in Vehicle with unstable 12V board net.

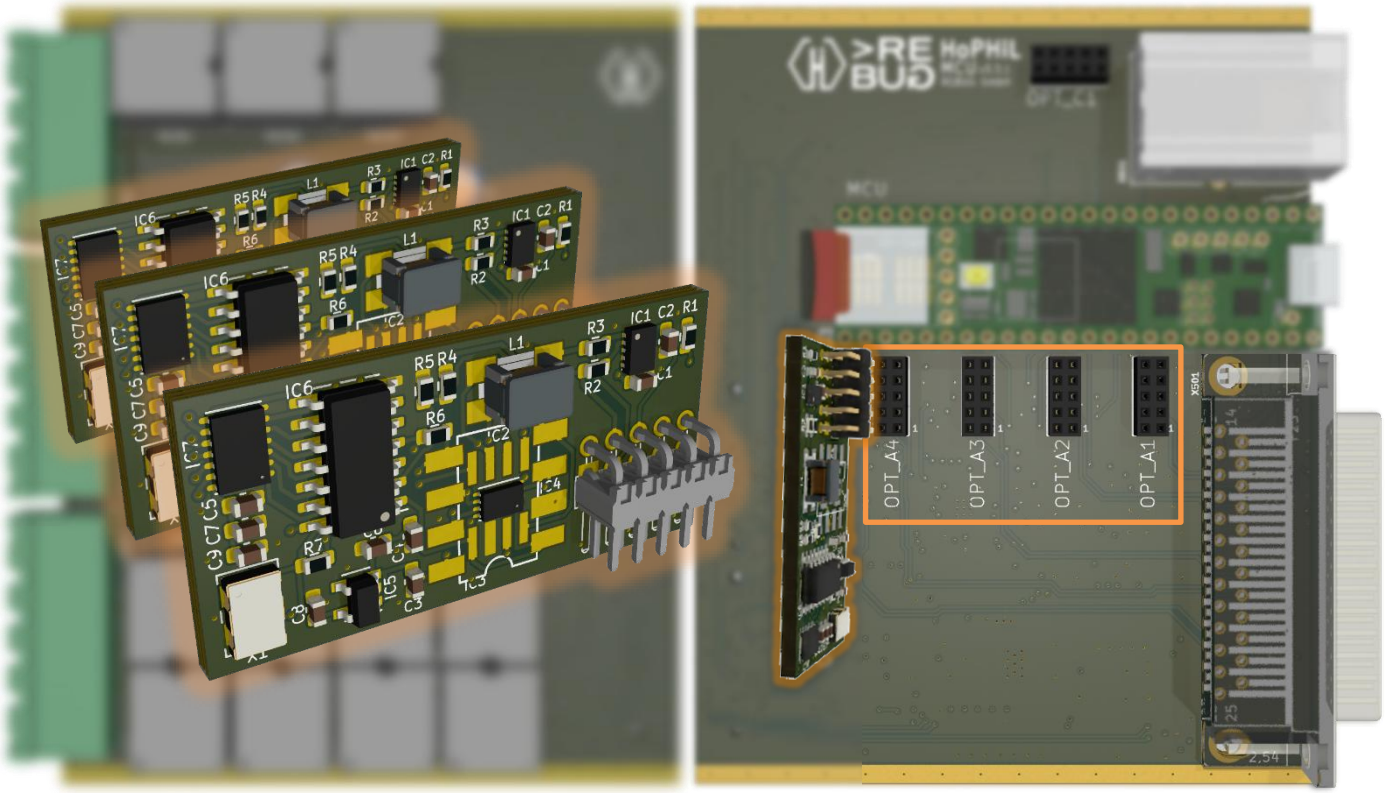


DSUB25 Pinout:

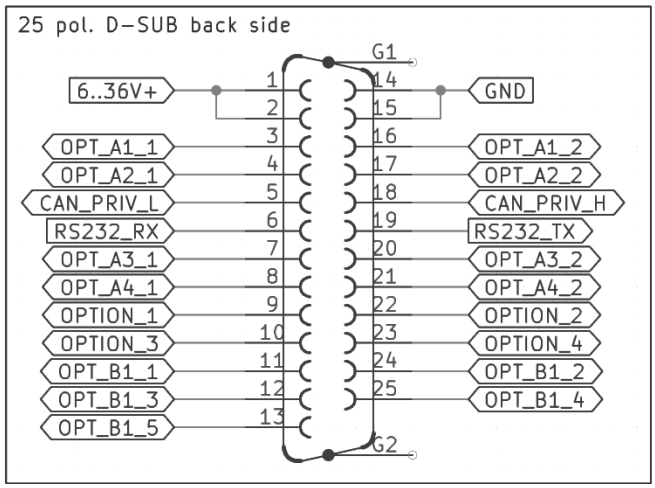


CANFD Shield

Element	Details	Notes
CANFD	1x 40MHz CANFD channel	Used for e.g. RBS, XCP, UDS
Termination Resistor	120 Ohm	ON/OFF via software



CANFD H/L is mapped to the rear DSUB-25:



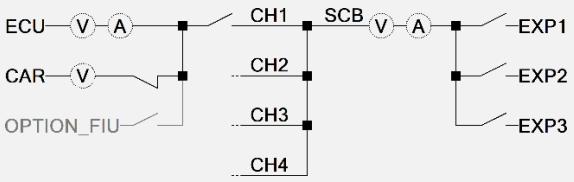
CANFD_OPT_A1 L -> OPT_A1_1
CANFD_OPT_A1 H -> OPT_A1_2

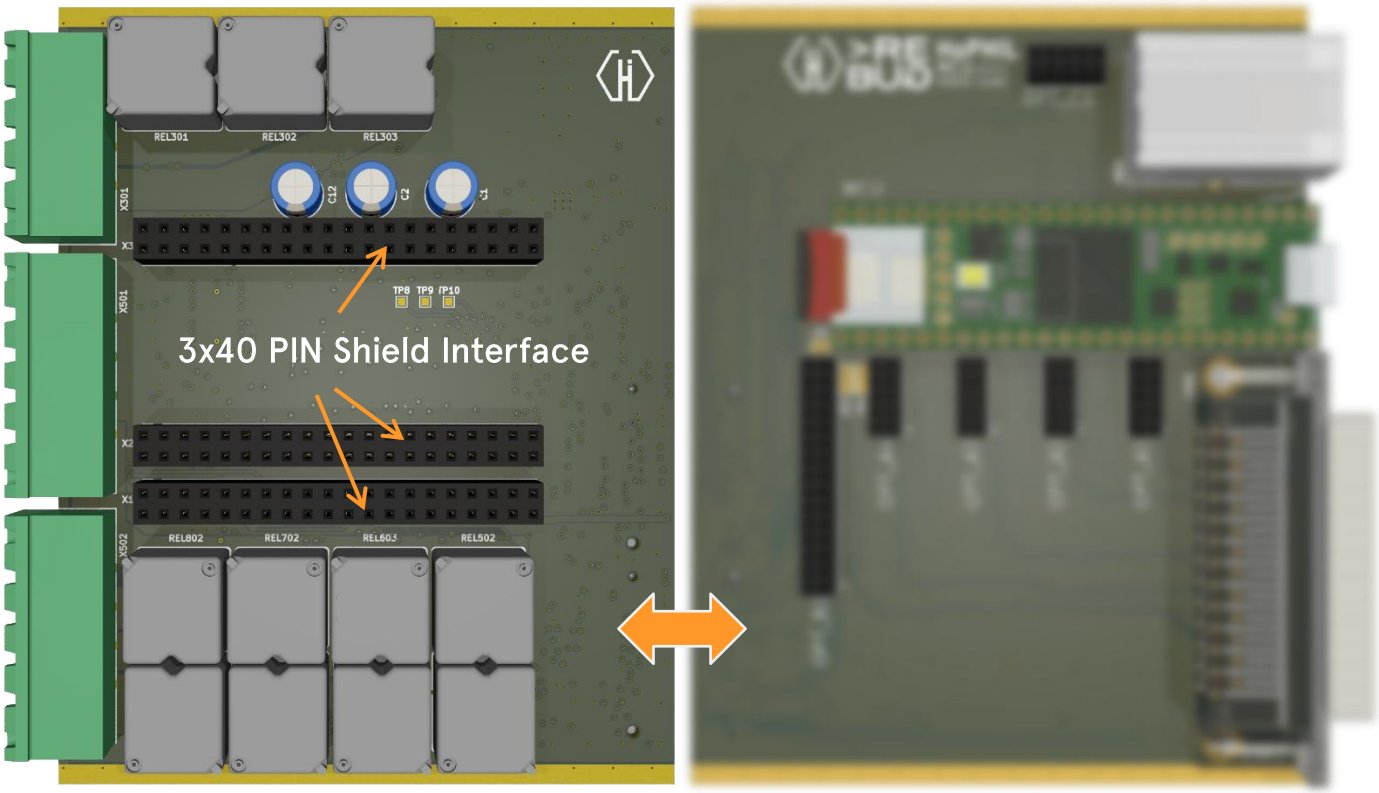
CANFD_OPT_A2 L -> OPT_A2_1
CANFD_OPT_A2 H -> OPT_A2_2

CANFD_OPT_A3 L -> OPT_A3_1
CANFD_OPT_A3 H -> OPT_A3_2

CANFD_OPT_A4 L -> OPT_A4_1
CANFD_OPT_A4 H -> OPT_A4_2

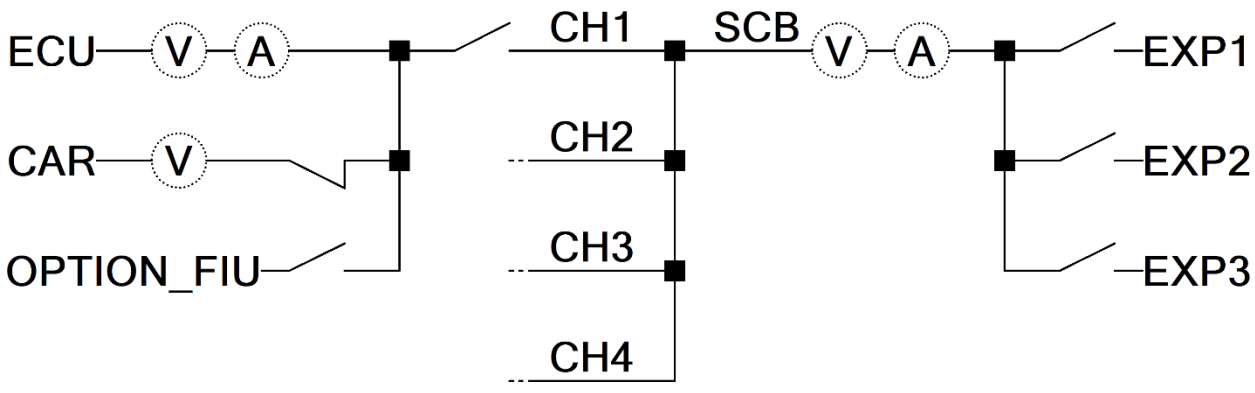
FIU Option

Element	Details	Notes
Functionality	• Open Line • Short to internal Short-Circuit-Bus (SCB) • Short between single channels • Short between multiple channels • Short of expansion bus (3x) to internal Short-Circuit-Bus	 (Measurements and OPTION_FIU available with FIU-Shield)
Channels	4	CAR Side / ECU Side (normally closed)
Internal Short Circuit Bus	1	Connect 1..n channels to internal short circuit bus to inject short circuit between channels or to expansion bus.
Expansion Buses	3	e.g. used for short to Clamp30, Clamp31 and external source or connect to other HoPHiL RT-Nodes and therefore create the possibility to short circuit channels of different RT-Nodes.
Max. current per channel	30A relays (25A opening, 30A closing) Up to 41A current measurement	see FIU Shield Type A
Expansion Slots	3 x 40 PIN expansion slots for advanced functionality.	see FIU Shield Type A



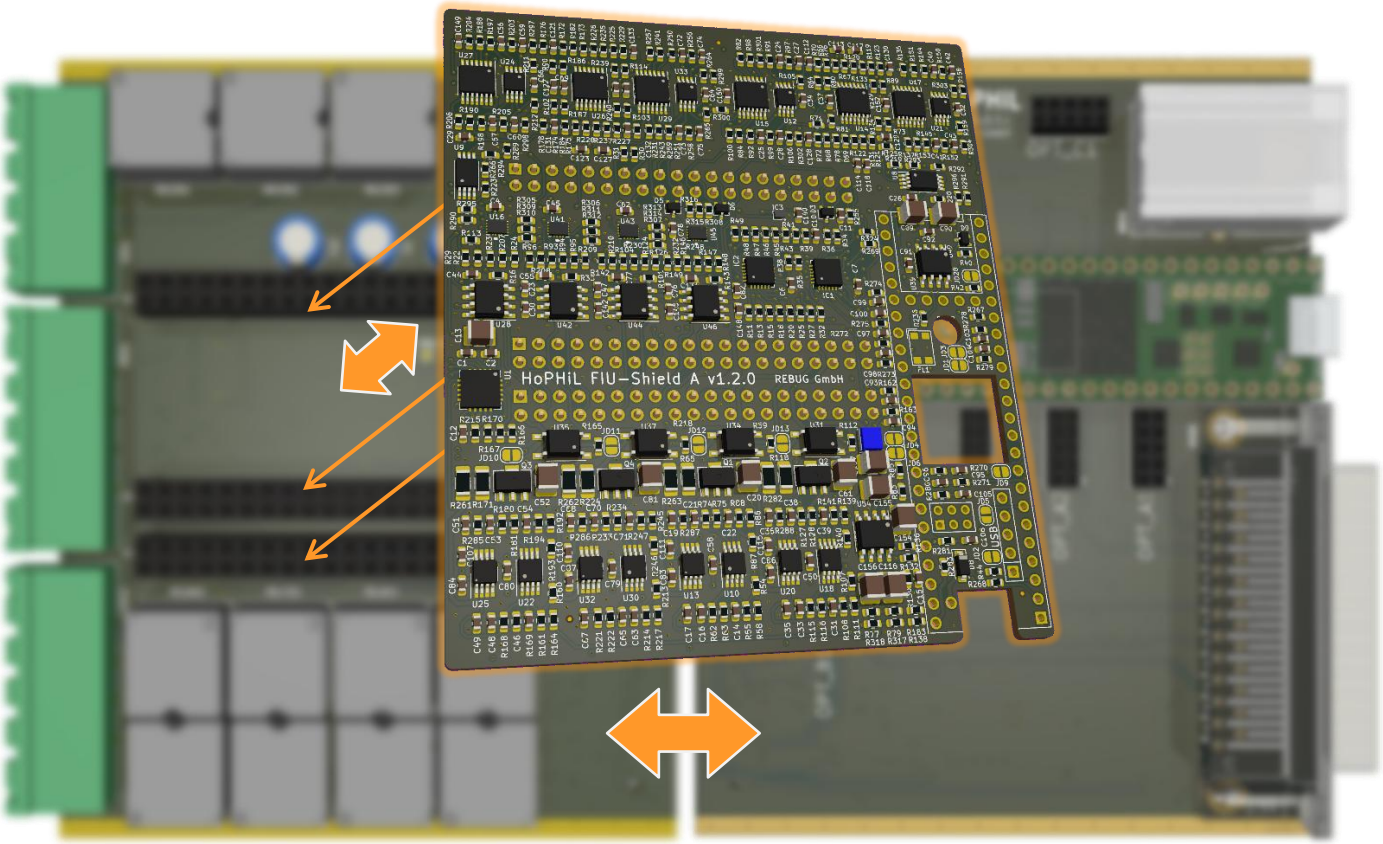
FIU_Shield_Type_A

Element	Details	Notes
Voltage Measurement CAR Side	+5V, +10V, +33V, ±2.5V, ±5V, ±16.5V 12Bit DMA oversampled to 16Bit	
Voltage Measurement ECU Side	+5V, +10V, +33V, ±2.5V, ±5V, ±16.5V 12Bit DMA oversampled to 16Bit	Short-Circuit-Bus has fixed range of -20V/+33V
Current Measurement	±2A, ±5A, ±10A, ±25A, -1/+3A, -3/+1A, -2.5/+7.5A, -7.5/+2.5A, -5/+15A, -15/+5A, -13.75/+41.25A, -41.75/+13.75A 12Bit DMA oversampled to 16Bit	Short-Circuit-Bus has fixed range of -20A/+30A
Filter Depths	ADCs support various software-filter-types and -depths for each measurement to optimize for data-acquisition-speed vs noise-levels.	
Measurement Speed	900kSamples/s (~64 samples/1ms per measurement point e.g. voltage ECU side channel 1)	
DAC / PWM	4x (1x per channel) constant DAC 0-13V or 2 level PWM (low level 0-13V, high level 0-13V)	PWM levels are adjustable between 0-13V to simulate voltage or current based sensors.
MOSFET for EXP1..3	3x; 1.5A max	For bounce-free connection of all expansion buses to internal short circuit bus.
ECU Reboot Detection	Adjust threshold limits to detect a reboot (even Warm-Power-Resets) based on current-measurement.	Reboots are detected automatically and increase a reboot-counter.
Energy Consumption Protection	Protect device under test from being destroyed due to overcurrent/too high energy consumption.	If device under test consumes too much energy (including user-configurable cooling-rate assumptions) a safe reaction is performed to protect the connected device (channel is switched off).

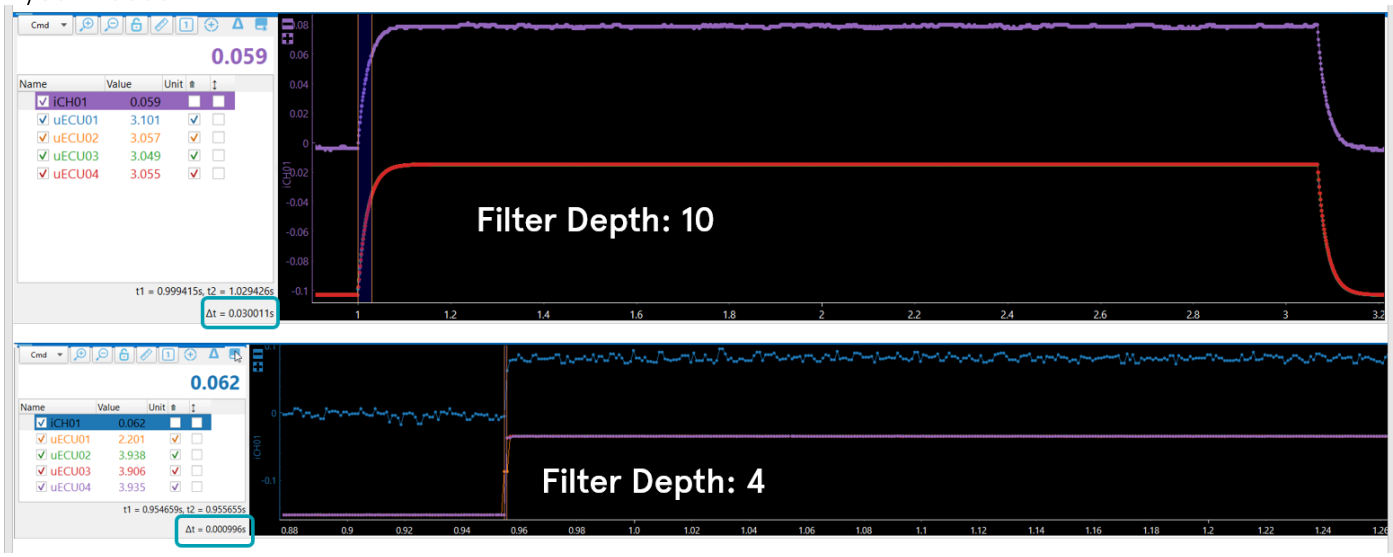


The FIU_Shield_Type_A is inserted into the 3×40-pin slots. The MCU board performs ADC sampling and filtering of voltage and current measurements.

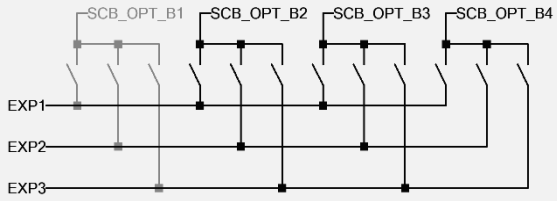
DAC/PWM signals are routed to the main FIU channels (ECU side) via analog switches and additionally to the OPTION_1–4 pins of the rear DSUB25 connector through the MCU-OPT_B connector. This enables internal use of the FIU_Shield_Type_A DAC signals for fault injection on the FIU_mini_Opt_B shield.

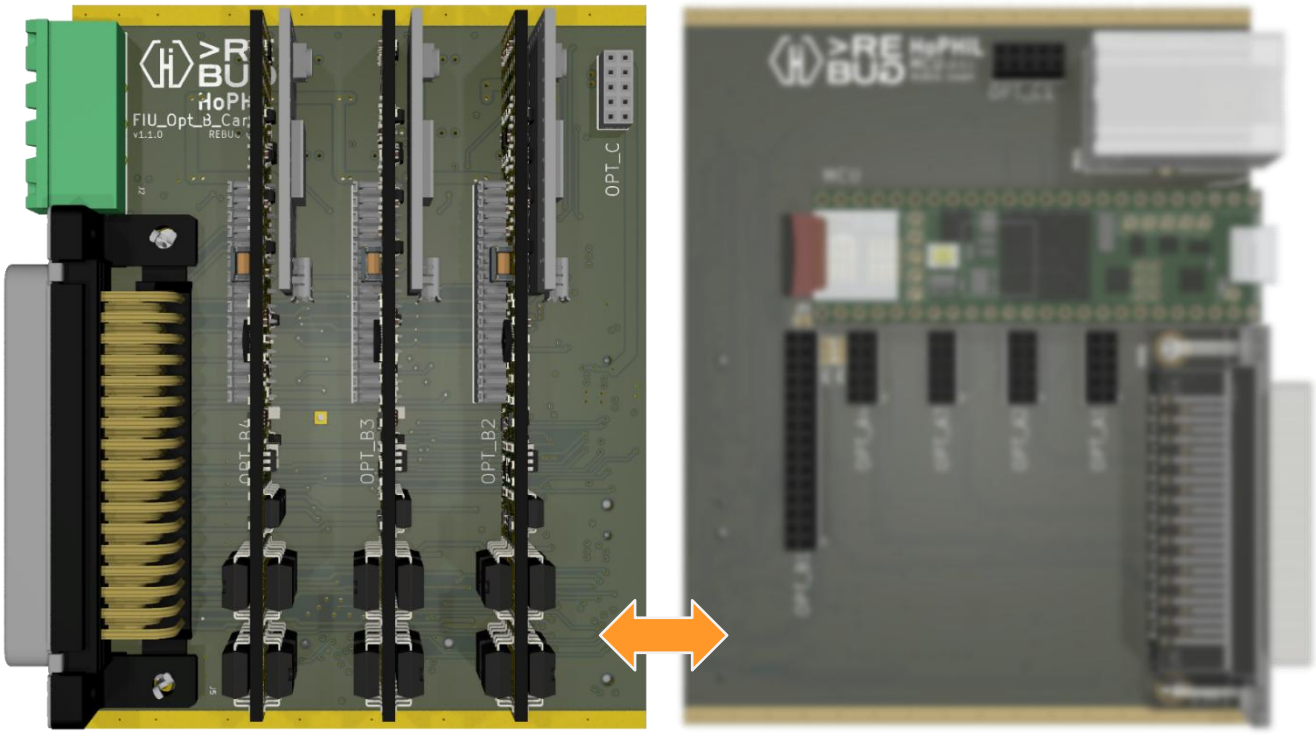


Adapt the filter depth to reduce noise or increase filter speed (e.g. 10ms vs 1ms filter) depending on your needs.



FIU_Opt_B_Carrier

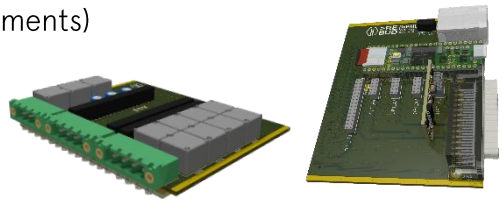
Element	Details	Notes
Functionality	• 3 OPT_B shield slots (4 when paired w. MCU) • Individual SCBs (FIU_mini_Opt_B) switchable to 3 separate Expansion Buses EXP1..3 • Short between single channels • Short between multiple channels • Short of expansion bus (3x) to internal Short-Circuit-Bus	 (OPT_B1 expansion-slot on MCU) (SCB available with FIU_mini_Opt_B)
Channels	As per configuration e.g. 3x FIU_mini_Opt_B -> 12 ECU/CAR channel-pairs (can be 24 independent analog inputs) e.g. 3x Pwr_DAC_Opt_B -> 24 DAC-outputs e.g. 3x Pwr_DAC_Opt_B -> 24 analog inputs	1 Additional OPT_B slot available on MCU, the Short-Circuit-Bus is routable into Opt_B_Carrier Expansion-Bus matrix as if part of carrier, primary channels go to rear-panel.
Expansion Buses	3 separate Buses connect any submodule-signals to each other or external sources; Any FIU_mini_Opt_B Short-Circuit-Bus can be connected to any Expansion Bus.	e.g. used for short to Clamp30, Clamp31 and external source / connect to further HoPHiL RT-Nodes and short-circuit channels of different RT-Nodes.
Max. values EXP1..3 relays	4,5A (9.5A 1ms 1-shot); ±40V; 0,02Ron	MOSFET-SSR for bounce-free connections
OPT_B2-4 OPT_D1	3 x 30 pin expansion slots for OPT_B 1 x 65 pin expansion slot OPT_D	e.g. FIU_mini_Opt_B, Pwr_DAC_Opt_B e.g. additional functionalities



System Configuration Examples

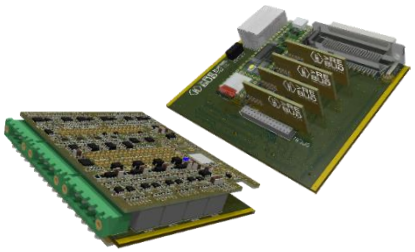
MCU, FIU_Option, 1 x CANFD_Shield:

- 4 ECU/CAR/SCB high-current FIU-channels (w/o measurements)
- 2 CANFD-channels
- 1 RS232
- Ethernet



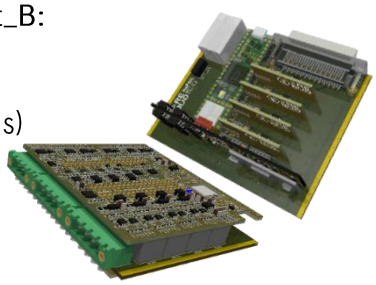
MCU, FIU_Option, FIU_Shield_Type_A, 4 x CANFD_Shield:

- 4 ECU/CAR/SCB high-current FIU-channels
- 4 DAC-channels (inject directly into ECU-side of FIU-channels)
- 5 CANFD-channels
- 1 RS232
- Ethernet



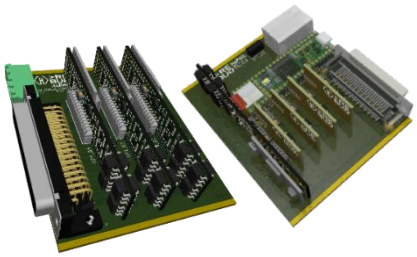
MCU, FIU_Option, FIU_Shield_Type_A, 4 x CANFD_Shield, 1 x FIU_mini_Opt_B:

- 4 ECU/CAR/SCB high-current FIU-channels
- 4 ECU/CAR/SCB FIU-channels or 8 analog inputs
- 4 DAC/PWM-channels (inject directly into ECU-side of 8 FIU-channels)
- 5 CANFD-Channels
- 1 RS232
- Ethernet



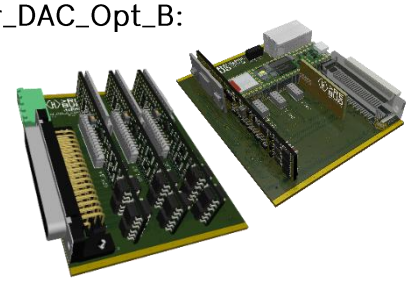
MCU, FIU_Opt_B_Carrier, 4 x CANFD_Shield, 4 x FIU_mini_Opt_B:

- 16 ECU/CAR/SCB FIU-channels or 32 analog inputs
- 5 CANFD-channels
- 1 RS232
- Ethernet



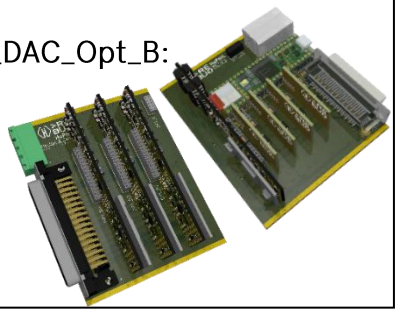
MCU, FIU_Opt_B_Carrier, 1 x CANFD_Shield, 3 x FIU_mini_Opt_B, 1 x Pwr_DAC_Opt_B:

- 12 ECU/CAR/SCB FIU-channels or 24 analog inputs
- 4 high-current DAC-channels or 4 analog inputs (external routing)
- 4 low-current DAC-channels or 4 analog inputs (external routing)
- 2 CANFD-channels
- RS232
- Ethernet

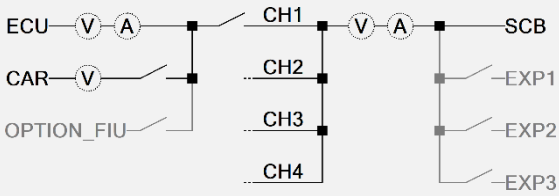


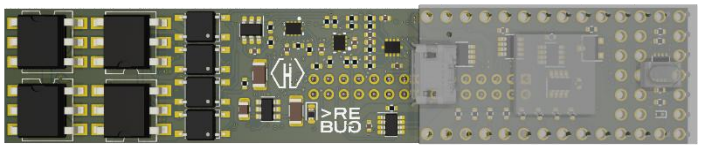
MCU, FIU_Opt_B_Carrier, 4 x CANFD_Shield, 1 x FIU_mini_Opt_B, 3 x Pwr_DAC_Opt_B:

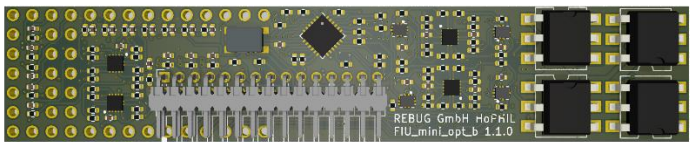
- 12 high-current DAC-channels or 12 analog inputs (external routing)
- 12 low-current DAC-channels or 12 analog inputs (external routing)
- 4 ECU/CAR/SCB FIU-channels or 8 analog inputs
- 5 CANFD-channels
- RS232
- Ethernet



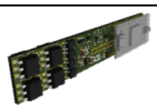
FIU_mini_Opt_B

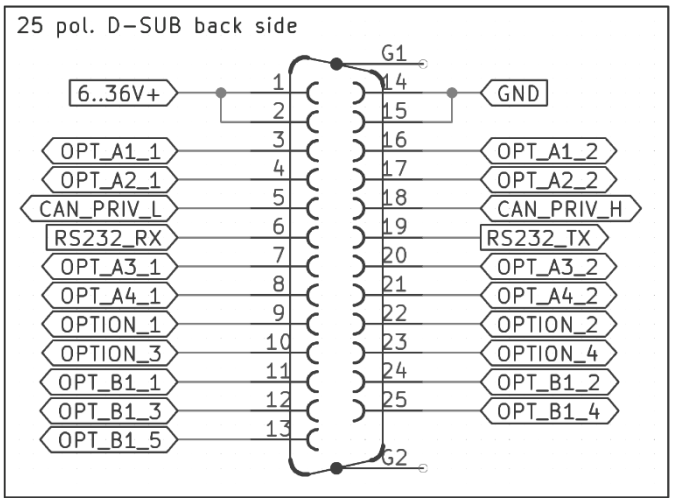
Element	Details	Notes
Functionality	• Open Line (normally open) • Short to internal Short-Circuit-Bus • Short between single channels • Short between multiple channels • Short of expansion bus (3x) to internal Short-Circuit-Bus (w. FIU_Opt_B_Carrier) • OPTION_FIU fault-injection per channel available with FIU_Shield_Type_A or FIU_Opt_B_Carrier	 (EXP1..3 and OPTION_FIU with FIU_Opt_B_Carrier or FIU_Option)
Channels	4	Open Line relay CAR/ECU normally open Alternatively, CAR/ECU sides can be utilized as separate analog inputs (x8; x9 in conjunction w. SCB-output on rear DSUB-25)
Internal Short Circuit Bus	1	Connect 1..n channels to internal short circuit bus to inject short circuit between channels or to expansion bus.





FIU_mini_Opt_B Pinout OPT-B1 (on MCU):



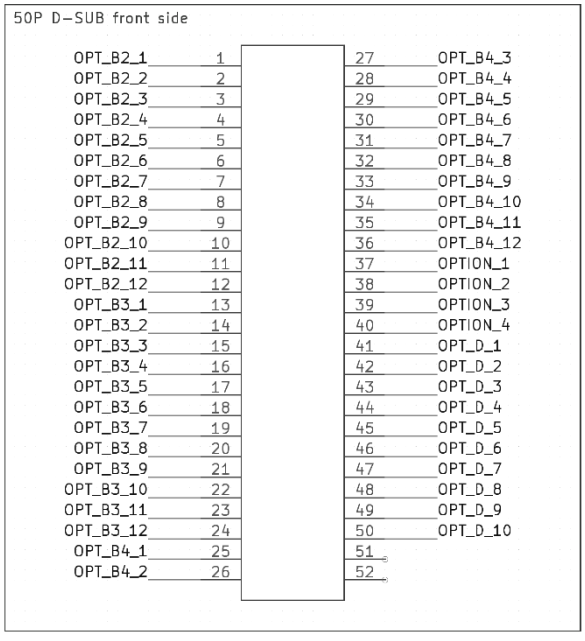


FIU_mini_Opt_B	MCU
OPT_B1_ECU1	OPTION_1
OPT_B1_ECU2	OPTION_2
OPT_B1_ECU3	OPTION_3
OPT_B1_ECU4	OPTION_4
OPT_B1_CAR1	OPT_B1_1
OPT_B1_CAR2	OPT_B1_2
OPT_B1_CAR3	OPT_B1_3
OPT_B1_CAR4	OPT_B1_4
OPT_B1_SCB	OPT_B1_5
*)	FIU_Opt_B_Carrier
OPT_B1_OPTION_FIU1	OPTION_1 (DSUB-50)
OPT_B1_OPTION_FIU2	OPTION_2 (DSUB-50)
OPT_B1_OPTION_FIU3	OPTION_3 (DSUB-50)
OPT_B1_OPTION_FIU4	OPTION_4 (DSUB-50)

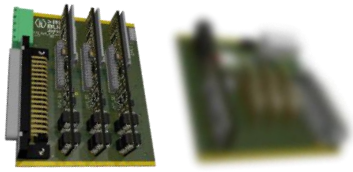
*) In a configuration with FIU_Shield_Type_A DAC/PWM-channels can be shared and routed internally into OPT_B1_OPTION_FIU1..4

Element	Details	Notes
Max. current channel relays	MOSFET-relays OL + SCB: 4,5A (9.5A 1ms 1-shot) (±40V; 0,02Ron) MOSFET-relays OPTION/FIU: 1,25A (3A 1ms 1-shot) (±40V; 0,15Ron)	
Voltage Measurement CAR Side	±16.5V, +33V, +16.5V 12Bit DMA oversampled to 16Bit	
Voltage Measurement ECU Side	±16.5V, +33V, +16.5V 12Bit DMA oversampled to 16Bit	Short-Circuit-Bus has fixed range of: -20/+33V
Current Measurement	±5A 12Bit DMA oversampled to 16Bit	On each channel located between ECU and other connections; On SCB located between channels and expansion buses
Filter Depths:	ADC-implementation supports various SW filter-types and depths to optimize for speed or noise-reduction.	
Measurement Speed	900kSamples/s (~64 samples/1ms per measurement-point e.g. voltage ECU side channel 1)	
Deployment options	MCU expansion slot OPT_B1 FIU_Opt_B_Carrier exp. slots OPT_B2..4 Communication via SPI and/or CAN_PRIV	By utilizing external CAN-bus control the shield can be used as standalone device (power-supply / packaging under development)

FIU_mini_Opt_B Pinout OPT_B2..4 (on FIU_Opt_B_Carrier):

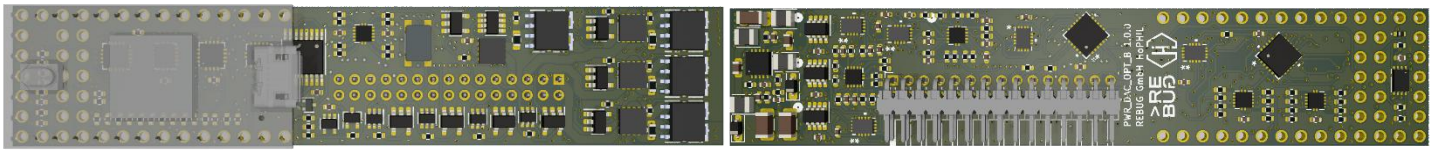


FIU_mini_Opt_B	FIU_Opt_B_Carrier
OPT_Bn_ECU1	OPT_Bn_1
OPT_Bn_ECU2	OPT_Bn_2
OPT_Bn_ECU3	OPT_Bn_3
OPT_Bn_ECU4	OPT_Bn_4
OPT_Bn_CAR1	OPT_Bn_5
OPT_Bn_CAR2	OPT_Bn_6
OPT_Bn_CAR3	OPT_Bn_7
OPT_Bn_CAR4	OPT_Bn_8
OPT_Bn_OPTION_FIU1	OPT_Bn_9
OPT_Bn_OPTION_FIU2	OPT_Bn_10
OPT_Bn_OPTION_FIU3	OPT_Bn_11
OPT_Bn_OPTION_FIU4	OPT_Bn_12

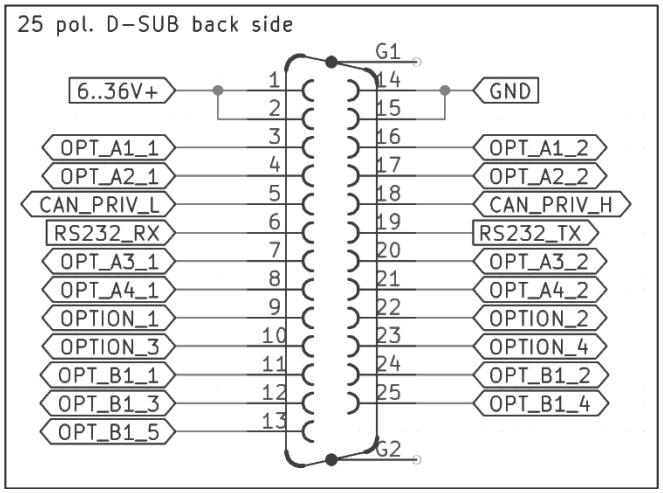


Pwr_DAC_Opt_B

Element	Details	Notes
Functionality	4 high power DAC-channels 4 low power DAC-channels 8x voltage-measurement exposed to outside	Voltage measurements are performed on outside of the switches, enabling the use as separate analog inputs (x8).
High-power channels 1..4	• MOSFET-push-pull stage with PID-control • DAC-output 12bit 0V..13V or 0V..24V • 5A DC (thermal limit); 10A pulse (<1ms) • Voltage-measurement (0V..25V) • Current-measurement (-5.5A..+5.5A) • Overcurrent-shutdown (switch opens)	
Low-power channels 5..8	• DAC-output 12bit 0V..13V (independent of power-supply) • 50mA source/sink (short-circuit-capable) • Voltage-measurement (0V..25V)	
Max. current per channel	Ch1..4: ±5A DC (thermal limits); 10A pulse (<1ms) Ch5..8: ±50mA (short-circuit-capable)	Total power-dissipation is determined by system-configuration and can be minimized with variable power-supply.
Voltage-range (output)	0V..13V or 0V..24V	
Voltage-range (survival)	0V..40V	

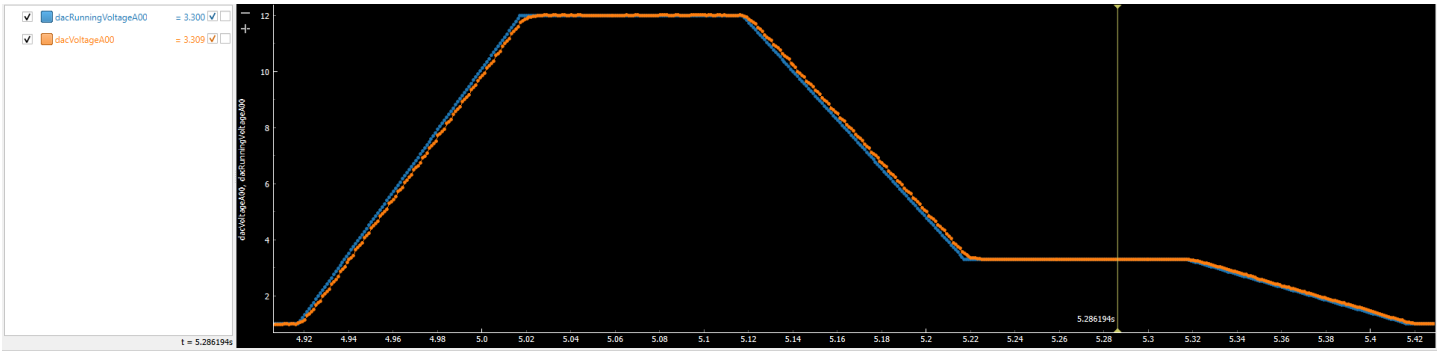


Pwr_DAC_Opt_B Pinout (OPT_B1 on MCU):

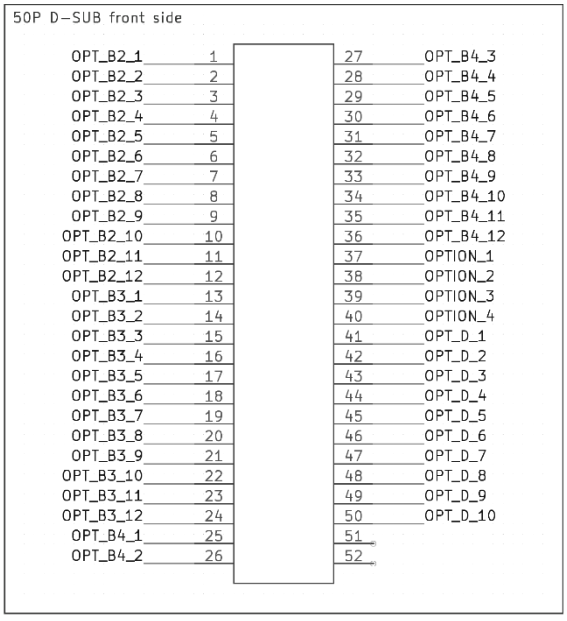


Pwr_DAC_Opt_B	MCU
CH1	OPTION_1
CH2	OPTION_2
CH3	OPTION_3
CH4	OPTION_4
CH5	OPT_B1_1
CH6	OPT_B1_2
CH7	OPT_B1_3
CH8	OPT_B1_4

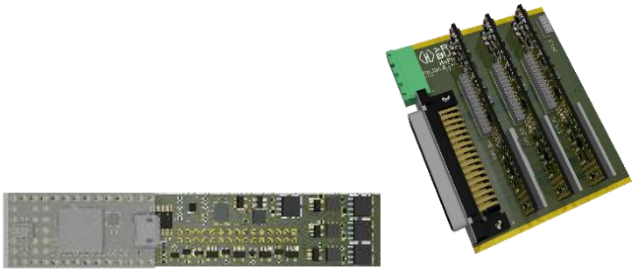
Element	Details	Notes
Voltage Measurement	0V..25V on all channels 12Bit DMA oversampled to 16Bit	
Current Measurement	±5.5A (Ch1..4 only) 12Bit DMA oversampled to 16Bit	
Filter Depths:	ADC-implementation supports various filter-types and filter-depths to optimize for speed or noise-reduction.	
Measurement Speed	900kSamples/s (~64 samples/1ms per measurement-point e.g. voltage ECU side channel 1)	
Voltage-curves	User-configurable voltage-curves run in real-time at 1ms temporal resolution.	e.g. used for electric tests on supply voltages like voltage drops or brownout



Pwr_DAC_Opt_B Pinout (OPT_B2..4 on FIU_Opt_B_Carrier):



Pwr_DAC_Opt_B	FIU_Opt_B_Carrier
CH1	OPT_Bn_1
CH2	OPT_Bn_2
CH3	OPT_Bn_3
CH4	OPT_Bn_4
CH5	OPT_Bn_5
CH6	OPT_Bn_6
CH7	OPT_Bn_7
CH8	OPT_Bn_8



LED Board

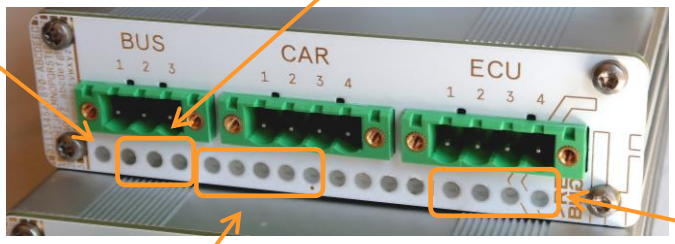
Element	Details	Notes
POWER LED	1x RGB LED	Status of internal voltage supply
STATUS LEDs	16x RGB LEDs	RGB – up to 8 states possible (color mapping see below)

POWER

5V	12V	15V BOOST	LED Color
N	N	N	OFF
Y	N	N	
Y	Y	N	
Y	Y	Y	

FIU Expansion BUS

RELAY	MOSFET	LED Color
N	N	def.
Y	N	
	Y	
Y	Y	



CAN 1-4, CAN_PRIV

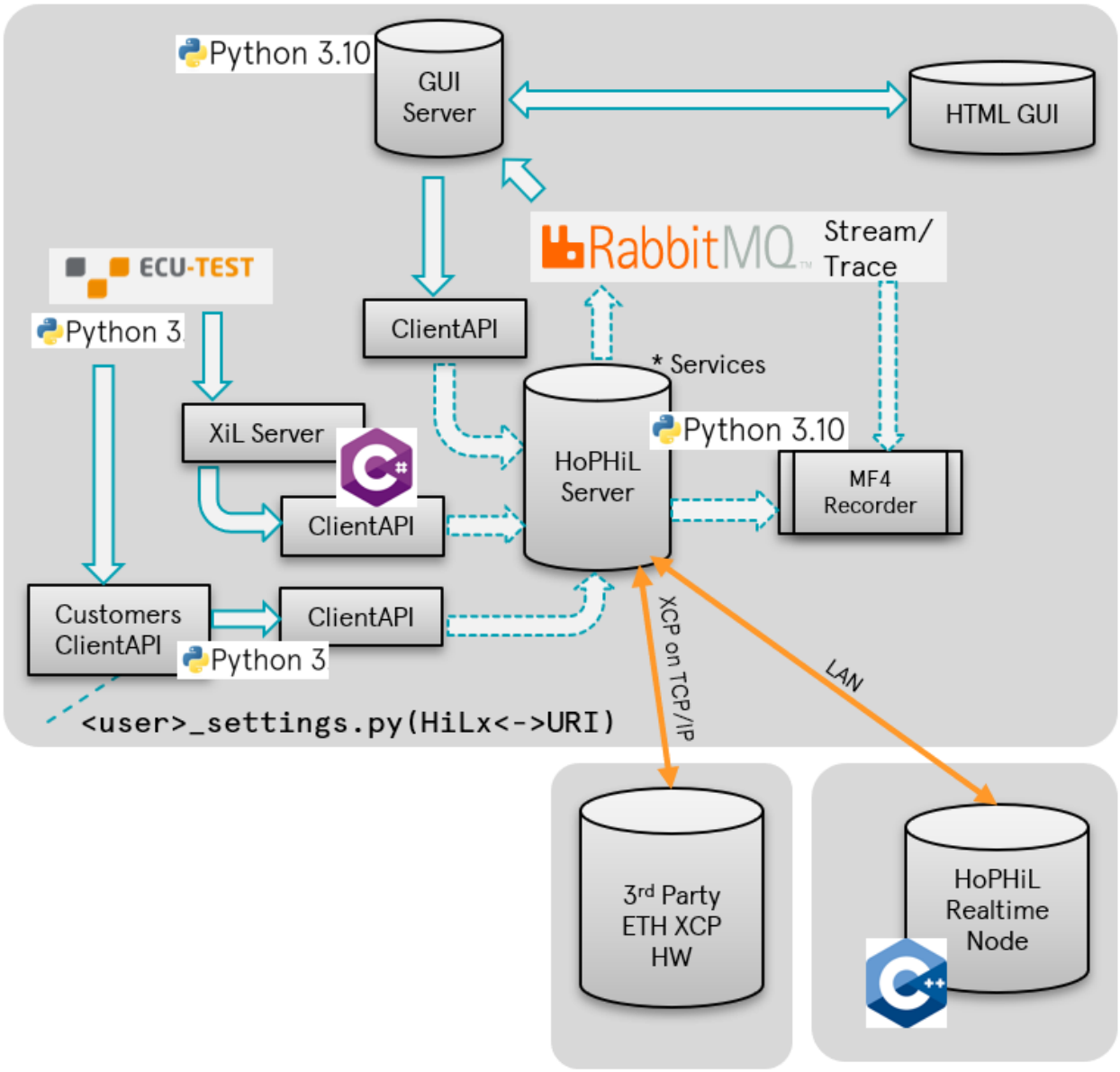
TX	TX Error	RX	LED Color
N	N	N	def.
Y	N	N	
N	Y	N	
N	N	Y	
Y	N	Y	
Y	Y	N	
Y	Y	Y	
Y	Y	Y	

Colors and blink frequency depend on traffic amount.

FIU Channels

Connected	Open Line	SCB	DAC/PWM	LED Color
Y	N	N	N	def.
N	Y	N	N	
N	Y	Y	N	
N	Y	N	Y	
Y	N	N	Y	
Y	N	Y	N	
N	Y	Y	Y	
Y	N	Y	Y	

HoPHiL Software, API and User Interface



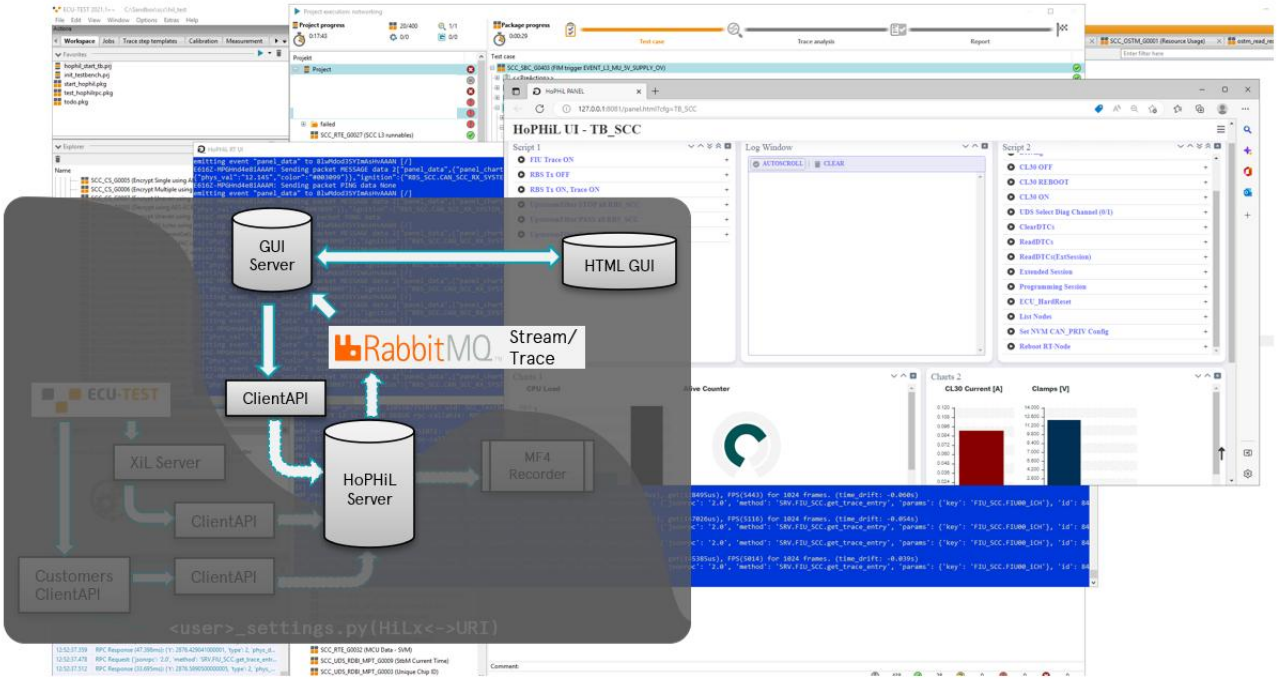
Software Features

Element	Details	Notes
Architecture	Service-based architecture: Service classes are RBS, UDS, XCP, FIU, RS232. Multiple instances of each service-type are supported. Client/Server architecture:	

Element	Details	Notes
	Allows to control each service from multiple clients at the same time. Open Source client API and Showcase Configuration	
Client-API	Python based Client-API to communicate to HoPHiL Server (PY 3.x) for full remote control functionality. Use as head-less system will ensure highest performance while full automation level is not limited. The integrated web based graphical user interface enables instant actions/analysis. The optional integration to tracetronic ECU Test is realized by the ASAM XiL interface.	e.g. parallel usage of native Python, Tracetronic ECU Test (XiL Server) and GUI is supported.
Rest Bus Simulation (RBS)	Full featured RBS is automatically generated from DBC or ARXML with the possibility to adapt configuration after loading. End2End protection (CRC and Alive Counter) supported: CRC J1850, H2F, AUTOSAR Profiles. Realtime Fault Injections on End2End and PDU based SecOC are supported. PDU based Cyber-Security SecOC is supported. Simulation Modes: ECU and Rest Bus	
CANFD BUS Gateway	"Man in the Middle" to forward or manipulate specific signals; Perform E2E or SecOC fault injections	Typically used for In-CAR testing or testing with multiple real ECUs in network. Single signals or signal groups can be manipulated while remaining are routed from real ECU.
Cyber Security	PDU based SecureOnboardCommunication (SecOC) including various fault injections and freshness synchronization. Deterministic execution, since CMAC and Freshness update are also performed on real-time hardware!	

Element	Details	Notes
	Debug messages for easier SecOC failure analysis. Secure Authentication via UDS enabled.	e.g. Daimler Zenzefi
RS232 Interface	For remote control of RS232 based devices (e.g. power supply)	
Unified Diagnostic Services (UDS)	Multiple diagnostic channels are supported per CAN Interface; CDD Database Support	
XCP	XCP over CANFD and XCP over Ethernet is supported. A2L database support	
FIU Control	All HW controls / measurements are available: • Open Line, • Short between lines, • Expansion/Short Circuit Bus control • Voltage/Current measurement • DAC/PWM control • Voltage/Current Range selection • Calibration of measurements	
Recording	ASAM MF4 based recording file	Usage of various filtering concepts (trace, decode and recording) to save CPU resources. UDS Requests including DTCs are part of recording.
MF4 Viewer	ASAM-MDF viewer to analyze mf4 files visually	
Continuous Testing / Continuous Integration	HoPHiL is designed and tested to be integrated in Jenkins and VMWare ESXi. We also offer an integration to Jenkins via our load balancing pipeline scripts.	Use load balancing to all available test systems (HiLs) to run a regression test within a much shorter time!

Graphical User Interface (GUI)

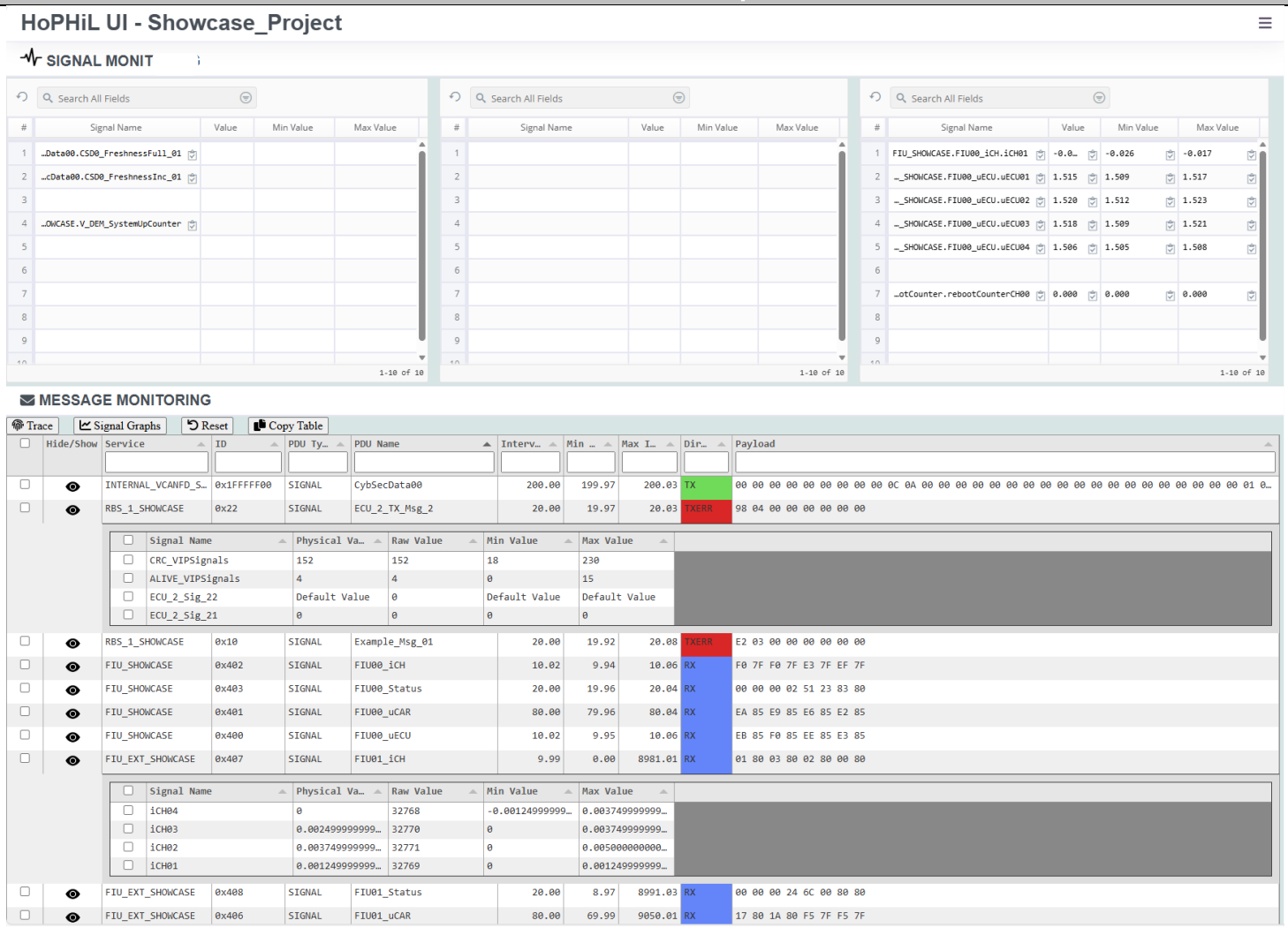


HTML Based GUI

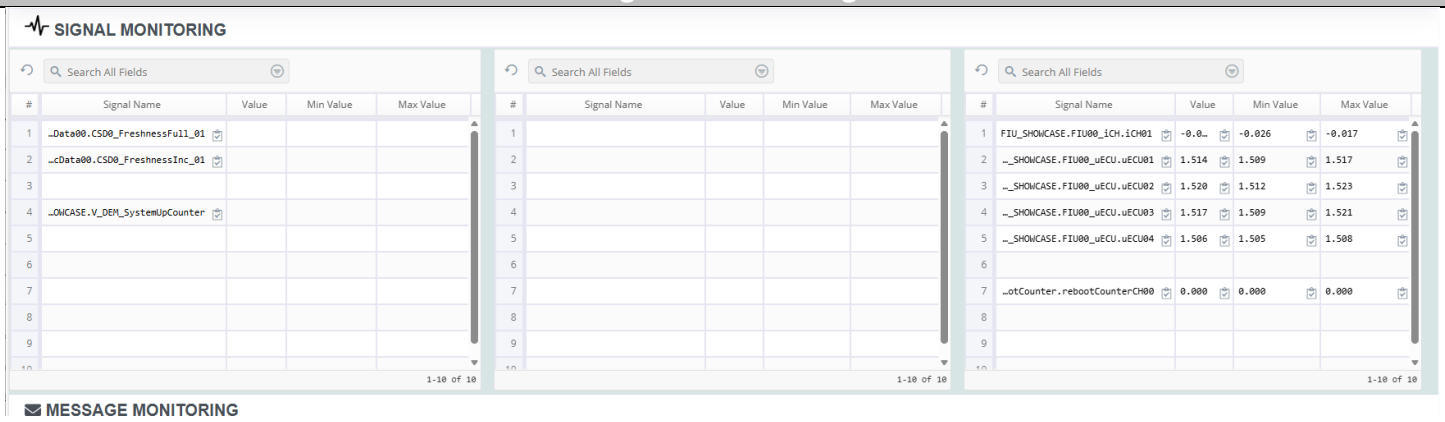
Element	Details	Notes
GUI	Web-UI accessed by Web Browser	GUI can be connected/disconnected at any time to running services. Dis-connect to safe CPU resources while regression test is performed.
Views	Message Monitoring See RX/TX frames, PDUs and signals including interval times, min/max values. The table overview allows to configure signals to specific cells. Panel View Control via individual command scripts (python based) and log them in dialog. Visualize via gauge, bar charts and interactive schematics. Sequential Trace Sequential view of selected messages/frames. Offline Signal Viewer Open .mf4 files for offline analysis of the recorded signals	

Message Monitoring

Overview Example

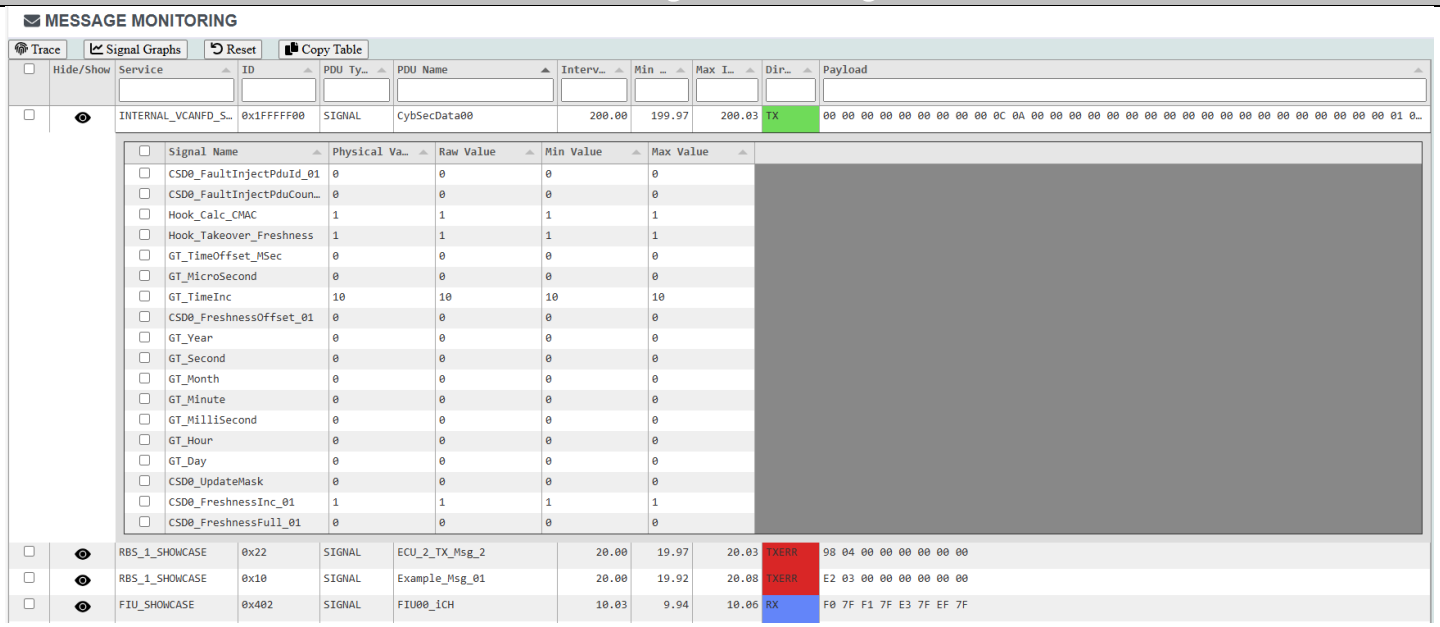


Signal Monitoring



Element	Description	Details
Signal Monitoring Tables	Configure size and number of tables including your favorite signals.	See: - actual value - min/max values

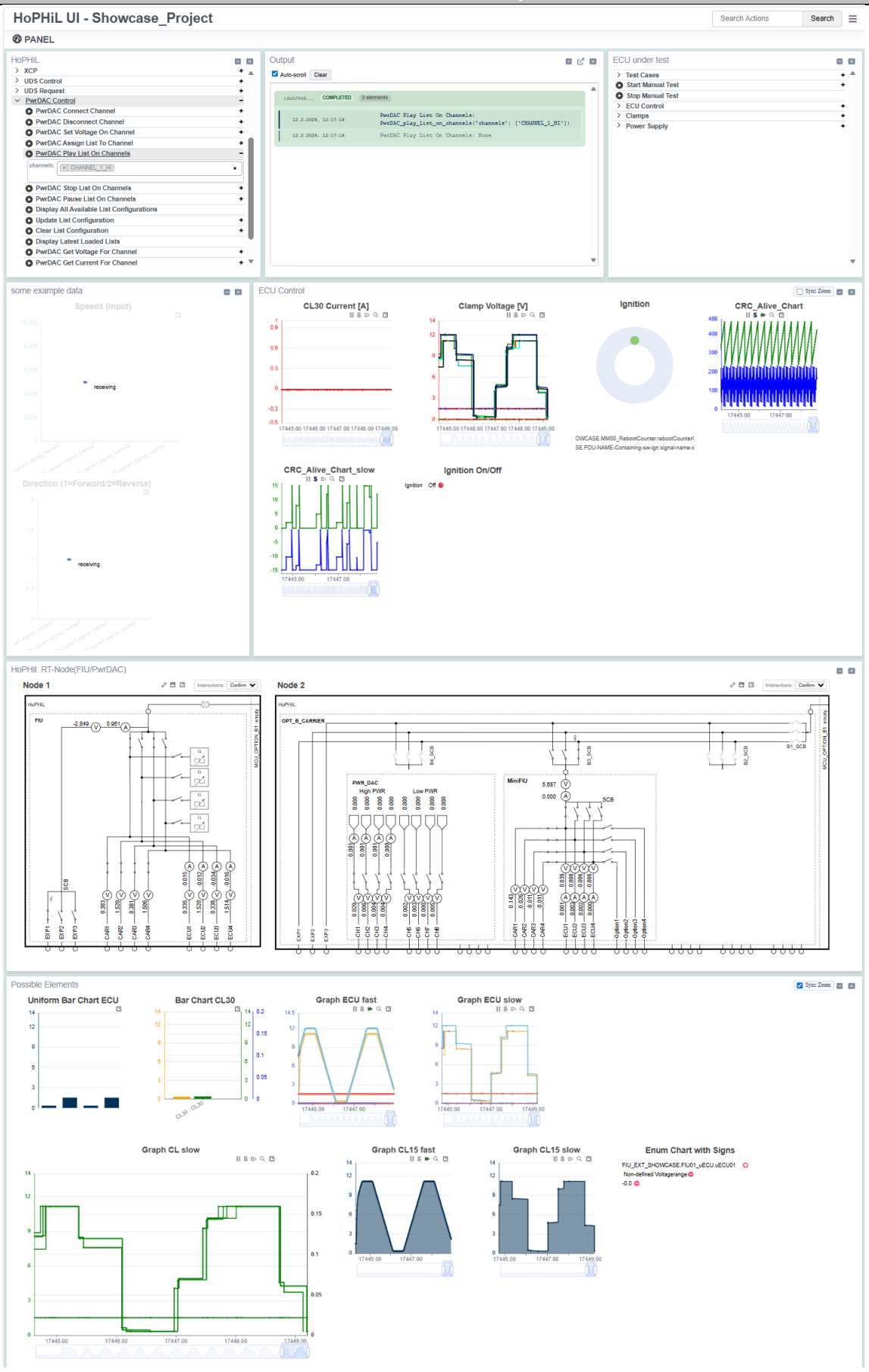
Message Monitoring



Element	Description	Details
Messages (PDU)	See message detailed information	- RAW Payload - PDU Type, ID, Name - Interval + Min/Max Interval - RX/TX/TX Error Status
Signals	Decoded Signals based on e.g. arxml/dbc	- Raw Value in Hex, - Physical Value - Min/Max Values

Panel View

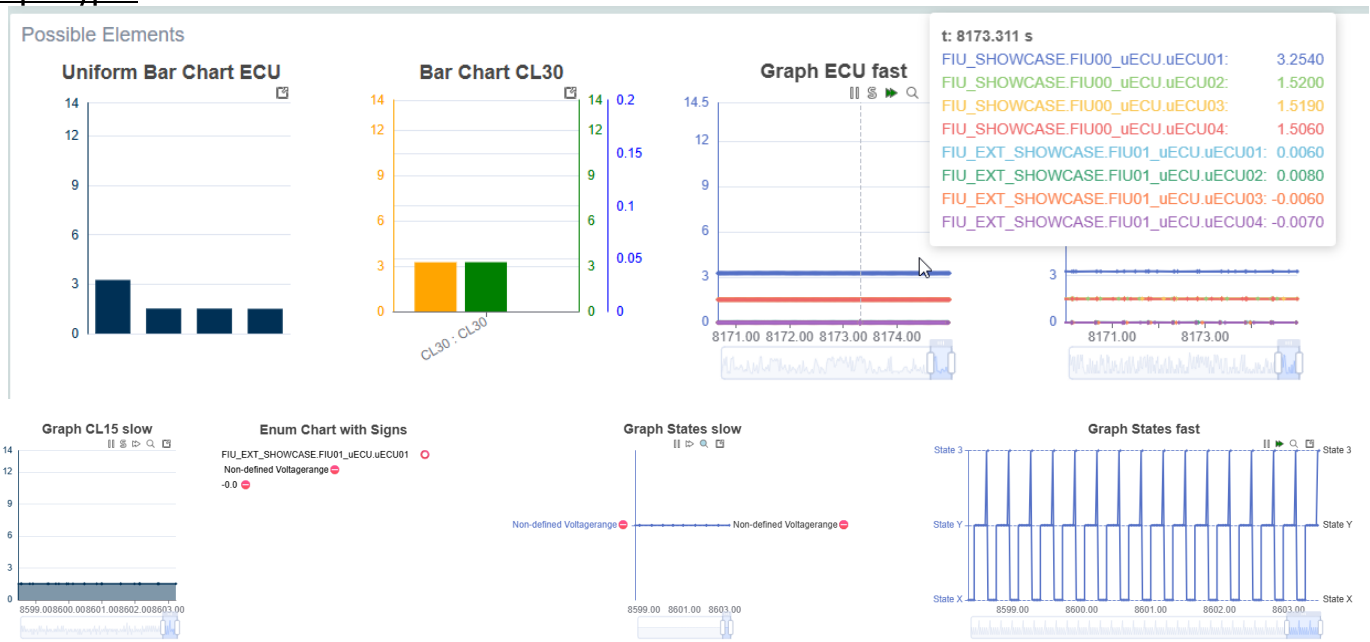
Overview Example



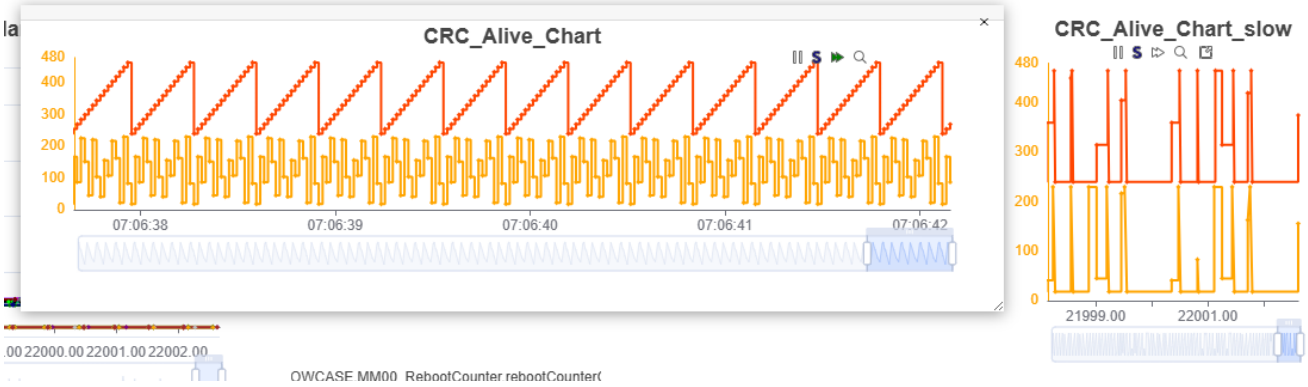
Element	Description	Details
Action Container	The left action container offers generic HoPHiL actions while the right container is typically used for customer/project specific actions.	- dynamically populated dropdown (while runtime) - interdependent and cascading dropdowns - Default Argument Values - None-able arguments ⇨ Easy add/remove/adapt interfaces via Python
Output	Detailed output of Actions and logging history	- Raw Value in Hex, - Physical Value - Min/Max Value

Graph Container

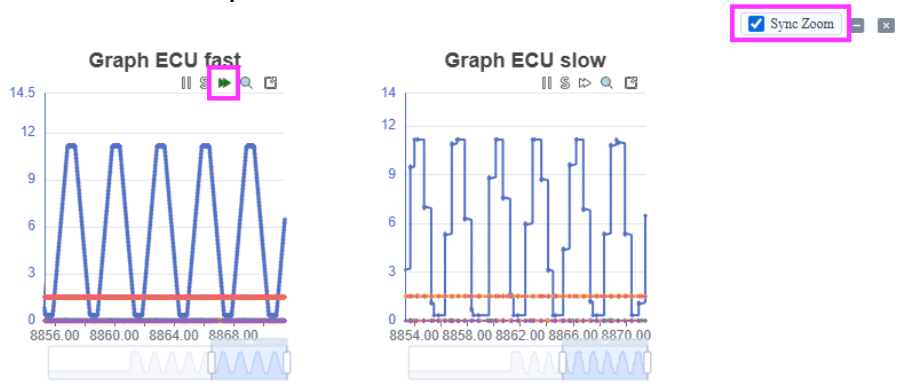
Graph Types

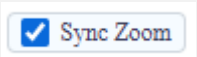


Popout

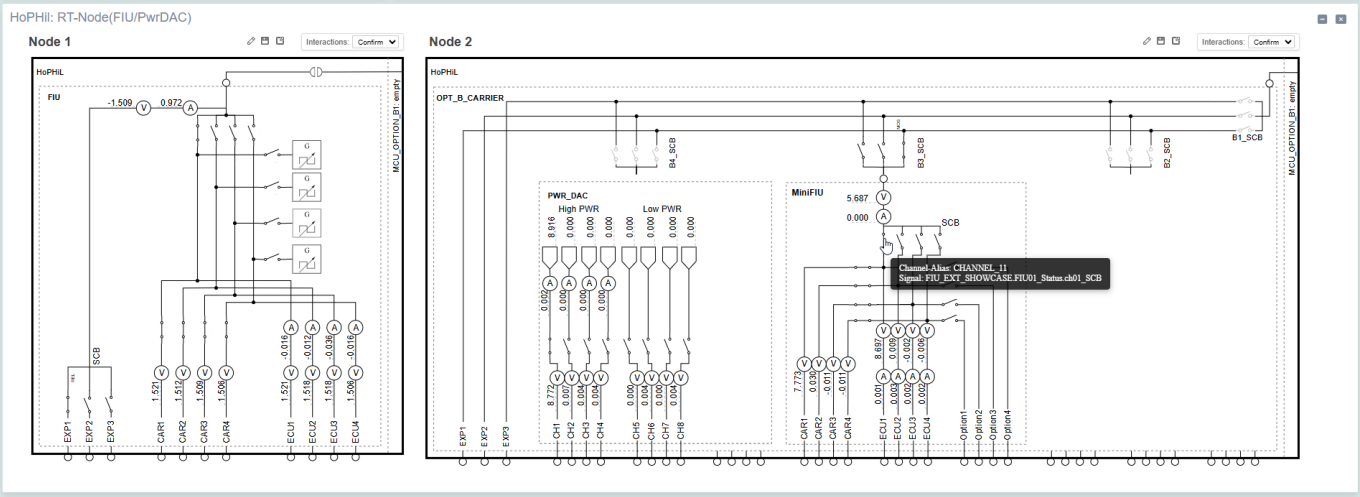


Realtime View and Sync Zoom

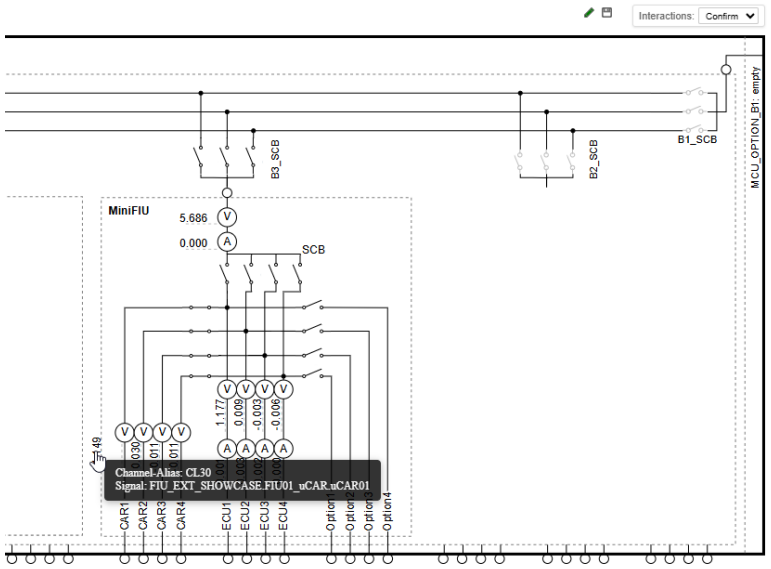


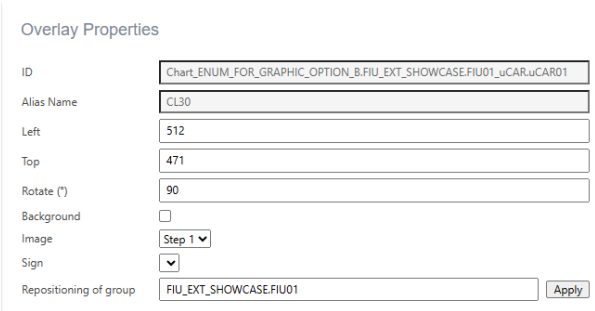
Element	Description	Details
Graph Container	Web Container containing a single or multiple graphs.	Adapt size Collapse or close containers
Graph Types	Various Graph types are supported: - Bar Charts - Gauge - Line Charts - Stacked Line Chart - State Charts - Enum Charts	Graph Features: - X/Y Zoom - Multiple Y axes - Hover information to see signals and values - Pause charts for better analysis - Stacking of signals
Popout	Popout one specific chart	Get a better overview – popout and expand the graph chart. Move it to other positions to compare e.g. with interactive schematics. Popped out charts support all graph features.
Realtime View	Enable realtime or resource optimized view.	Enable realtime view to see each signal value over time or disable to get the resource optimized view to save CPU Load. Min/Max/Average values are still shown in this mode.
Sync View 	Synchronize Zoom (Factor and Range)	Same zoom factor and zoom range are used across all graphs within a graph container.

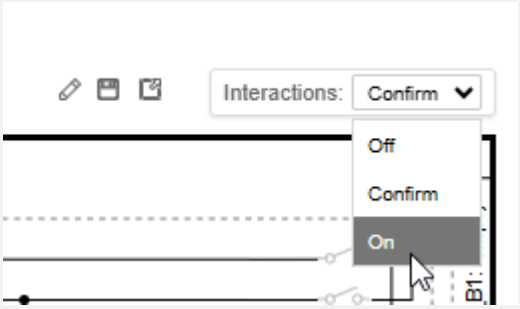
Live View



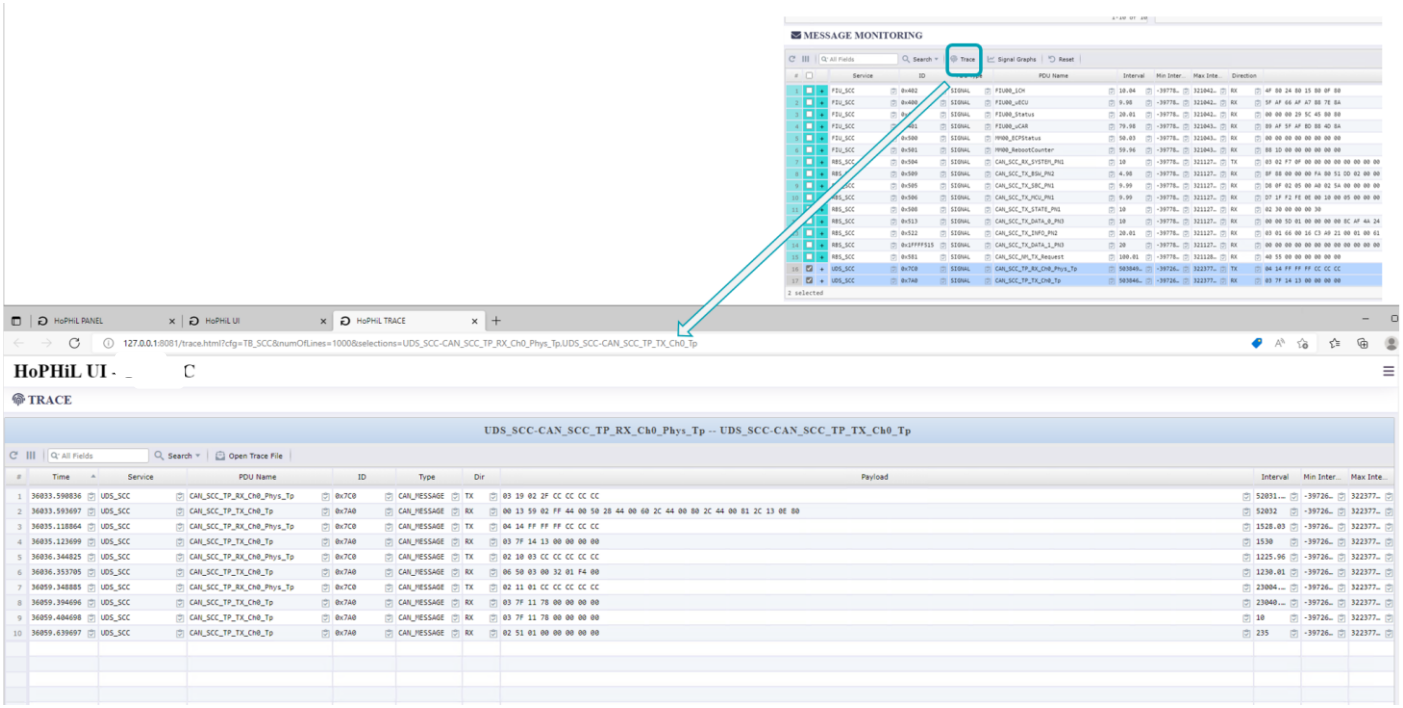
Edit View



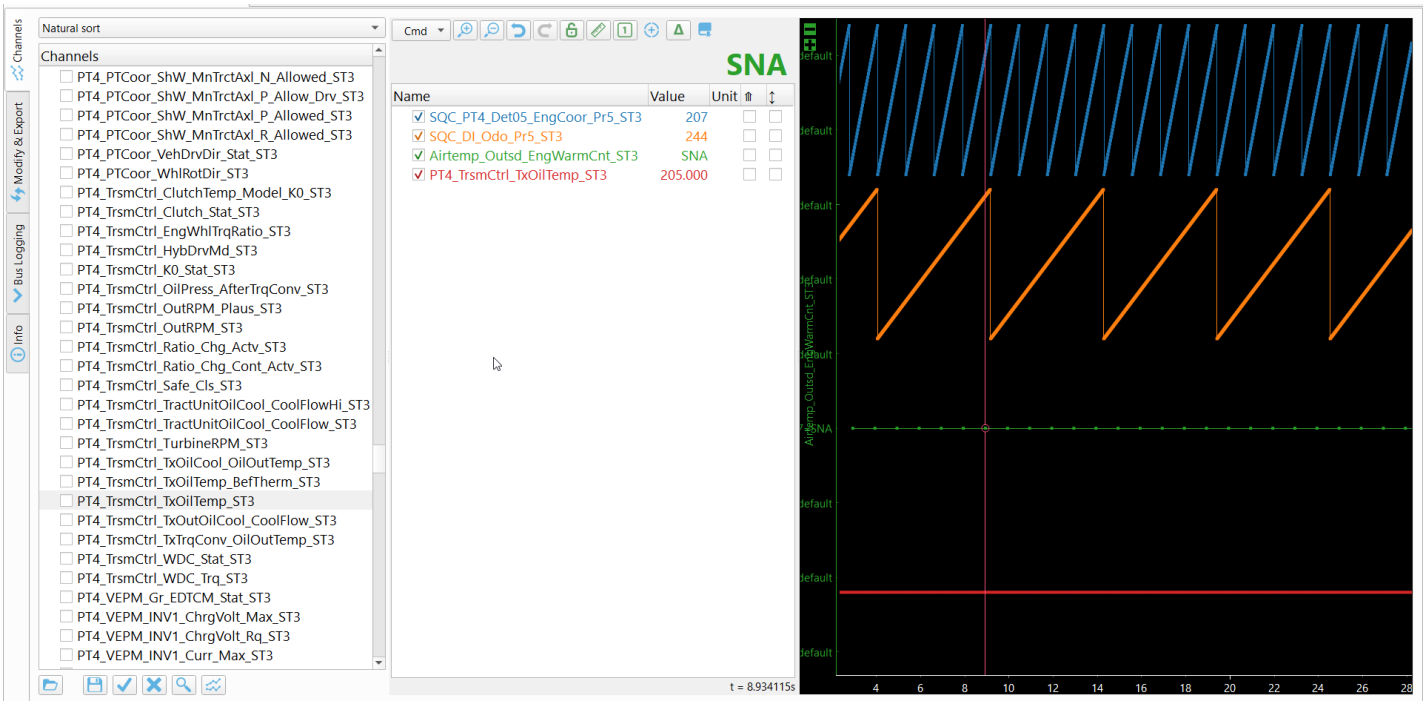


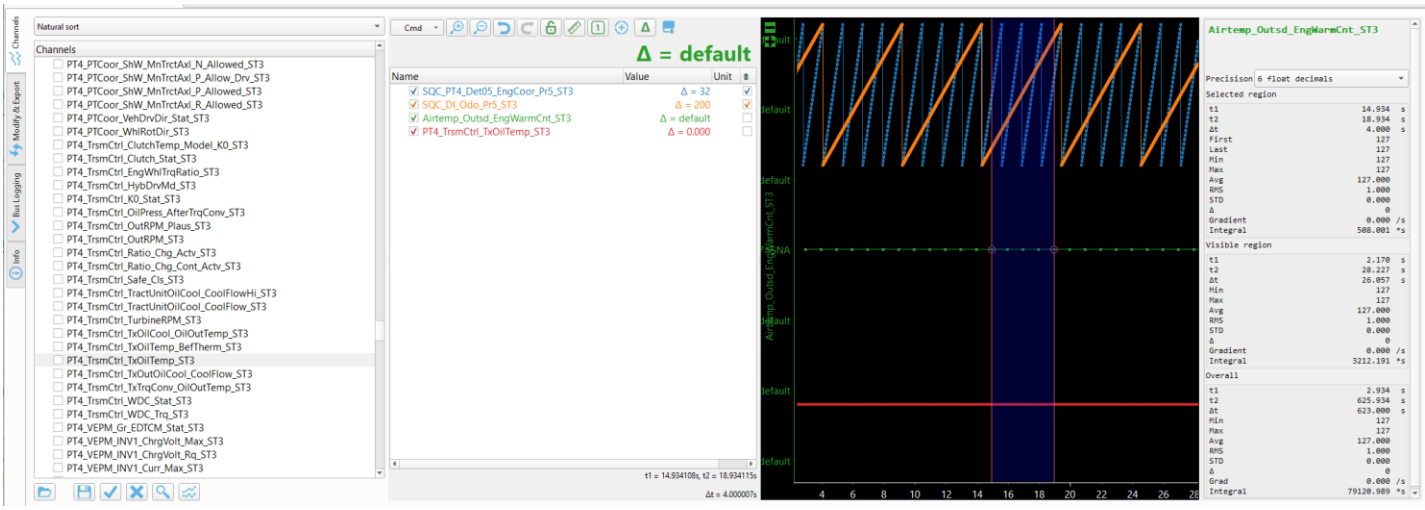
Element	Description	Details
Live View	Enhance usability in complex systems by combining schematics or images with live signal data and interactive hardware switching control.	Place measurement signals to display real-time values and switches to visualize their open/closed state. Hovering over an element reveals the source signal and its alias name. Change the state of a switch by clicking on it. To configure the interaction behavior, specify whether confirmation is required or disable interaction entirely. 
Edit View	Graphically configure the position of signal data and switches using overlays.	Use Cursor to move the overlay or change value in dialog form. Use the "Repositioning of Group" Feature to move all overlays by the given x/y offset of first moved overlay.
HoPHiL Library	Create system views quickly and easily using our HoPHiL schematics library.	Our HoPHiL schematics graphics library is based on the free Web Vector graphics tool DrawIO. Export the final schematics as vector graphics like .svg to ensure lossless scaling without quality degradation.

Sequential Trace



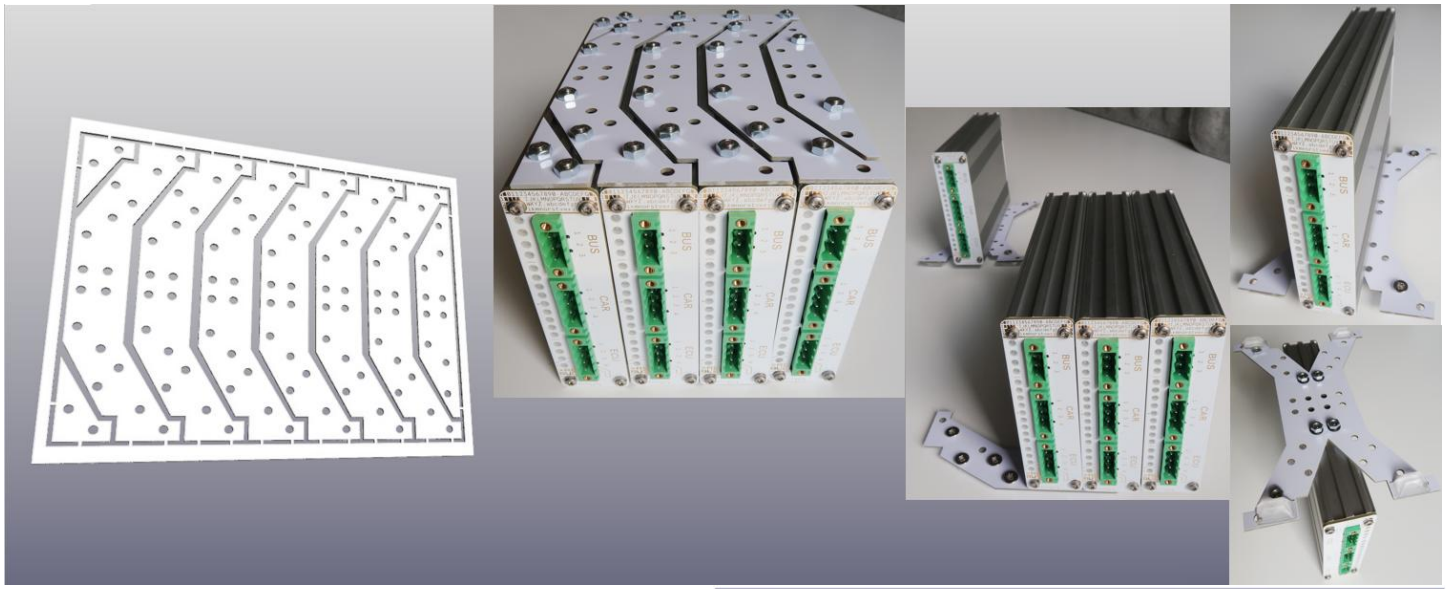
Element	Description	Details
Trace	Display a subset of messages in a sequential trace view.	Typically used for analyzing protocols such as UDS, where each message may depend on the previous one. Select a message in the trace and activate the trace view to display it.

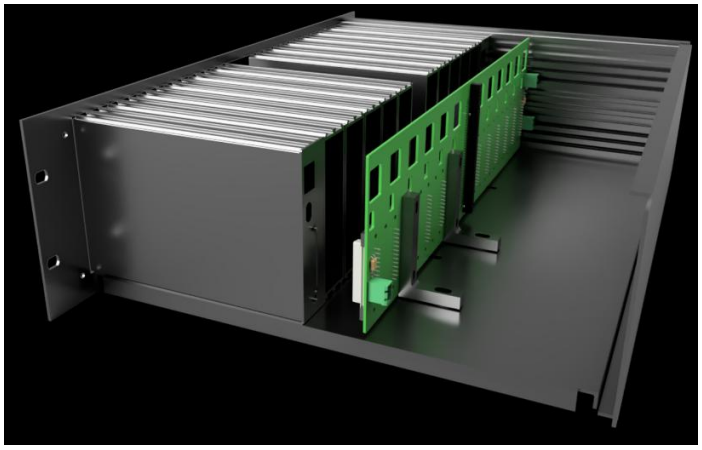




Element	Description	Details
Offline Recording View	ASAMMDF is a powerful open source MDF viewer for MF4 recording files typically used in automotive industry.	HoPHiL records data in the .mf4 format and supports the use of ASAMMDF which is a powerful open-source offline viewer with advanced features comparable to commercial tools. Just a few of the most used features are mentioned: - Physical/Raw/Hex/binary signal representation - Cursor, Differential Cursors - Step Modes, Stacking of signals - Computed Signals - Predefined Signal-Sets - Statistics

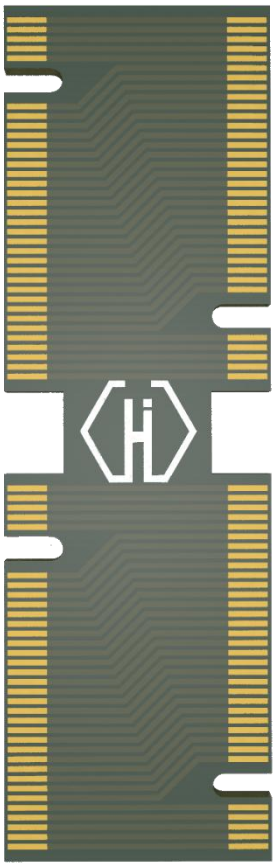
Mounting Concepts

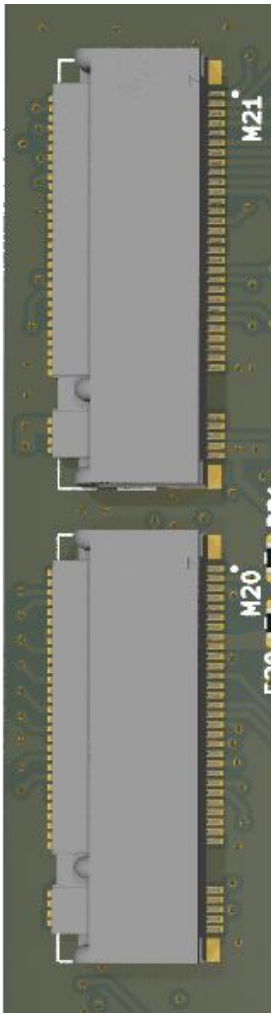




Mounting Varieties

Element	Details	Notes
Scalable Mounting System	Simple but most applicable concept. Highest flexibility in mounting single or multiple HoPHiL real time nodes. The V-Groove Concept allows fast mounting / dismounting.	
V-Groove Concept	Just use our countersunk head screws to fix the hardware on your already existing mounting racks.	
19-inch Rack	Up to 12 devices and a signal routing interface in the middle of the 3U rack will fit to existing 19-inch systems.	Our backplane connects up to 12 devices and a center slot serves as signal interface. Devices are hot-swappable.
DIN Rail	28mm aluminum clip to mount on a DIN Rail.	





CAN_PRIV_L	1	2	CAN_PRIV_H
OPT_A1_1	3	4	OPT_A1_2
OPT_A2_1	5	6	OPT_A2_2
OPT_A3_1	7	8	OPT_A3_2
OPT_A4_1	9	10	OPT_A4_2
OPT_B1_1	11	12	OPT_B1_2
IO_EXP_1	13	14	IO_EXP_2
IO_EXP_3	15	16	IO_EXP_4
IO_EXP_5	17	18	IO_EXP_6
OPTION_1	19	20	OPTION_2
OPTION_3	21	22	OPTION_4
OPT_B1_3	23	24	OPT_B1_4
OPT_B1_5	25	26	OPT_B1_GPIO_SCB_EXT_2
D32_IO	27	28	OPT_B1_GPIO_SCB_EXT_1
D4_IO_PWM	29	30	
D34_IO_RX8	31	32	
OPT_B1_GPIO_SCB_EXT_3	33	34	
GND	35	36	
RS232_TX1	37	38	D6_IO_PWM
RS232_RX1	39	40	D5_IO_PWM
	41	42	D3_IO_PWM
GND	43	44	D2_IO_PWM
D27_IO_A13_SCK1	45	46	D1_IO_TX1_MISO1_CTX2_PWM
D26_IO_A12_MOSI1	47	48	D0_IO_RX1_CS1_CRX2_PWM
GND	49	50	GND
GND	51	52	GND
GND	53	54	GND
GND	55	56	GND
	57	58	GND
5V	67	68	5V
5V	69	70	5V
3V3	71	72	12V_BOARD_NET
12V_BOARD_NET	73	74	12V_BOARD_NET
12V_BOARD_NET	75		

1-2199119-5
M1

5V_VHST	1	2	D37_IO_CS0_PWM
D48_IO_CS0_RX8	3	4	D36_IO_CS0_PWM
D35_IO_TX8	5	6	D53_IO_CLK_TX1_PWM
	7	8	D40_IO_A16
D54_IO_D3_MISO2	9	10	D51_IO_CS1_SCL1_PWM
	11	12	D23_IO_A9_CRX1_PWM
	13	14	+12V
+12V	15	16	+12V
+12V	17	18	D29_IO_TX7_PWM
D18_IO_A4_SDA0_QUADTIM	19	20	D25_IO_A11_RX6_SDA2_PWM
D49_IO_D1_SCK2	21	22	D41_IO_A17
D15_IO_A1_RX3_QUADTIM	23	24	D24_IO_A10_TX6_SCL2_PWM
D19_IO_A5_SCL0_QUADTIM	25	26	D14_IO_A0_TX3_QUADTIM
D21_IO_A7_RX5	27	28	D20_IO_A6_TX5
D39_IO_A15_MISO1	29	30	D22_IO_A8_CTX1_PWM
D28_IO_RX7_PWM	31	32	D38_IO_A14_CS1
D52_IO_D0_RX1	33	34	D33_IO_PWM
GND	35	36	D50_IO_D2_MOSI2
D13_IO_LED_SCK0_QUADTIM	37	38	GND
D12_IO_MISO0_QUADTIM	39	40	D11_IO_MOSI0_QUADTIM
D9_IO_PWM	41	42	D10_IO_CS0_QUADTIM
GND	43	44	RESET
D+	45	46	D17_IO_A3_TX4_SDA1
D-	47	48	D16_IO_A2_RX4_SCL1
GND	49	50	GND
GND	51	52	GND
GND	53	54	GND
GND	55	56	GND
	57	58	GND
5V	67	68	5V
5V	69	70	5V
3V3	71	72	12V_BOARD_NET
12V_BOARD_NET	73	74	12V_BOARD_NET
12V_BOARD_NET	75		

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M2